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San Francisco
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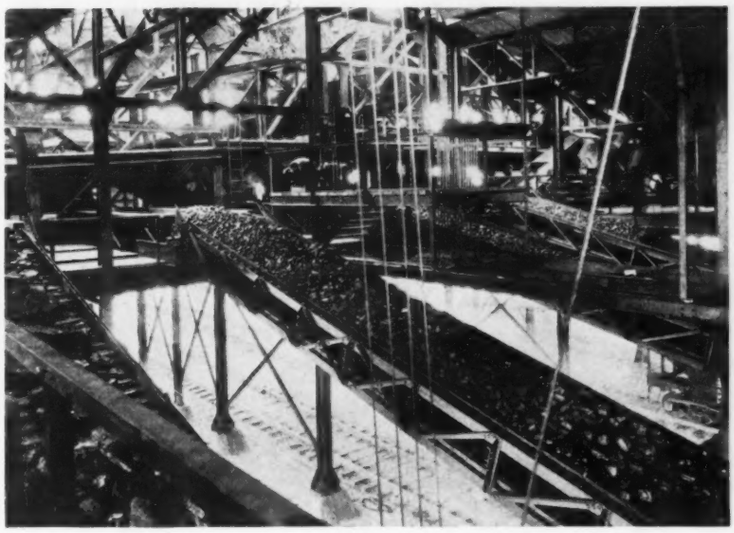

Four loading booms push-button operated United Electric Coal Co.

SEPTEMBER 13, 1930

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It always has—and always will

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ELECTRICAL WORLD

for the Week Ending

September 13, 1930

Look out for rising investment costs, warns N.E.L.A. head

Power Commission accountants would upset cost figures

Segregate merchandising costs, Wisconsin orders

Claude launches tube successfully for tropic power

—W. A. JONES, as N.E.L.A. president, warns industry of increasing investment per dollar of annual gross revenue. In 1922 it was $472, in 1929 $564. Rates decreased 8 per cent in same period.

—POWER COMMISSION accountant protests pre-license appraisal costs. Figure of $924,850 for Waterville project of Carolina Power & Light Company should be reduced by $779,329, he says. Write-up of $22,048,000 in common stock of company alleged.

—WISCONSIN COMMISSION orders all costs associated with conduct of merchandising activity to be charged to that department. Will require new accounting plan for utilities by January 1.

—BROOKLYN EDISON, as part of established program for putting overhead wires underground, will spend $20,600,000 to do so this year.

—GEORGE WESTINGHOUSE, pioneer manufacturer, to have an imposing memorial in Schenley Park, Pittsburgh. Company appropriation and gifts of 60,000 employees make tribute possible.

—INSULL enters Manitoba. Purchase of operating properties in Canada by National Utilities, Ltd., marks entrance of Chicago interests in this province.

—CLAUDE TUBE successfully launched. After two costly failures French scientist succeeds in floating a mile-long tube essential to his plan for obtaining electrical energy from tropic waters.

—BRITISH GRID SCHEME includes plans for 100-square mile model rural electrified section in Norfolk.

NEWS OF THE WEEK

Power Board Accountants Again Dispute Pre-License Cost Figures

ONCE more the Federal Power Commission's accountants have recommended the disallowance of a very large proportion of the pre-license costs set up by a hydro-electric company. This time the development concerned is the Waterville plant of the Carolina Power & Light Company, on the Pigeon River in North Carolina. The licensee is controlled by the National Power & Light Company, both corporations being managed and supervised by the Electric Bond & Share Company. The Carolina company's appraisers put the pre-license costs at $924,850.70. From this the Federal Power Commission accountants would strike $779,329.28.

The largest item selected for elimination is $359,128.98, representing, it is said, 1,150 acres of land at about $300 an acre for which the federal accountants think that about $5 an acre would be a proper value. Other items proposed for elimination are "overheads," fees and charges of various kinds totaling $420,200.

The report says that certain records were not made available for examination, so that the total elimination is subject both to land and water rights adjustment and such other adjustments as the records and further proceedings may show to be proper. The report has been filed, and the licensee has 30 days in which to file a protest.

The report also maintains that the fixed capital of the Carolina Power & Light Company has been "written up" by about $22,048,000, 47,261 shares of common stock of the old Carolina Power & Light Company before its merger, under the retained name, with four other companies being carried at an estimated ledger value of at least $500 a share, although the original issuing company carried them at $100. The difference, as figured by the federal men, is $19,048,000, in addition to which a "write-up" of $3,000,000 represents a "reserve account created at the organization of the Pigeon River Power Company through a charge of like amount to its plant and investment account."

The Power Commission accountants have also reported a lack of records to support ledger entries in trying to establish investment of the Minnesota Power & Light Company in the Winton development of the Kawishiwi River, Minn. This is also a "Bond and Share" property, being controlled by the American Power & Light Company. Its headquarters are at Duluth.

Conowingo Costs Are Still Undetermined

A FORMAL motion to reinstate the Public Service Commissions of Maryland and Pennsylvania as parties in determining the cost of the Conowingo project has been made by Charles A. Russell, solicitor of the Federal Power Commission. Mr. Russell also has recommended that William V. King, chief accountant of the Federal Power Commission, prepare a preliminary accounting report of the Conowingo project and serve it on the Philadelphia Electric Company. This, Mr. Russell hopes, will speed up the cost determination of the project, which has dragged out now for about four years.

Determination of the pre-license cost will be a step nearer when a report on the value of lands owned by the licensee outside the project boundaries is received from War Department engineers, the Federal Power Commission says.

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Doherty Company Calls Power Board Oppressive

CONFLICT over preliminary investment figures on the Table Rock project of the Empire District Electric Company on the White River in Missouri has arisen, the applicant for license having filed a protesting brief with the Federal Power Commission in which it says that the commission exceeded its authority under the act in requiring by order an agreement on the preliminary

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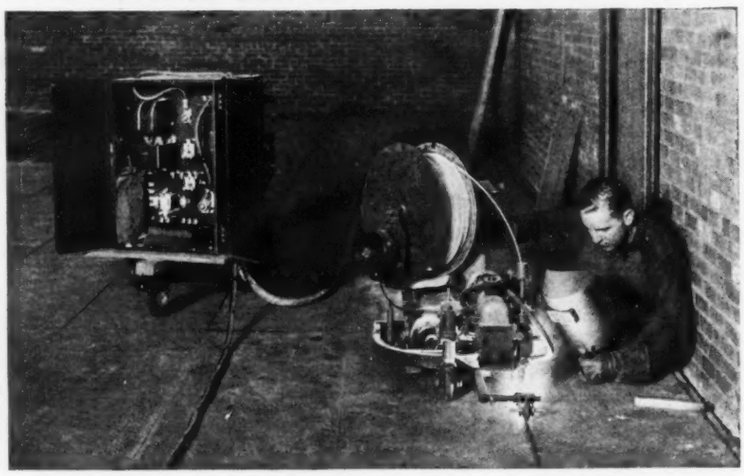
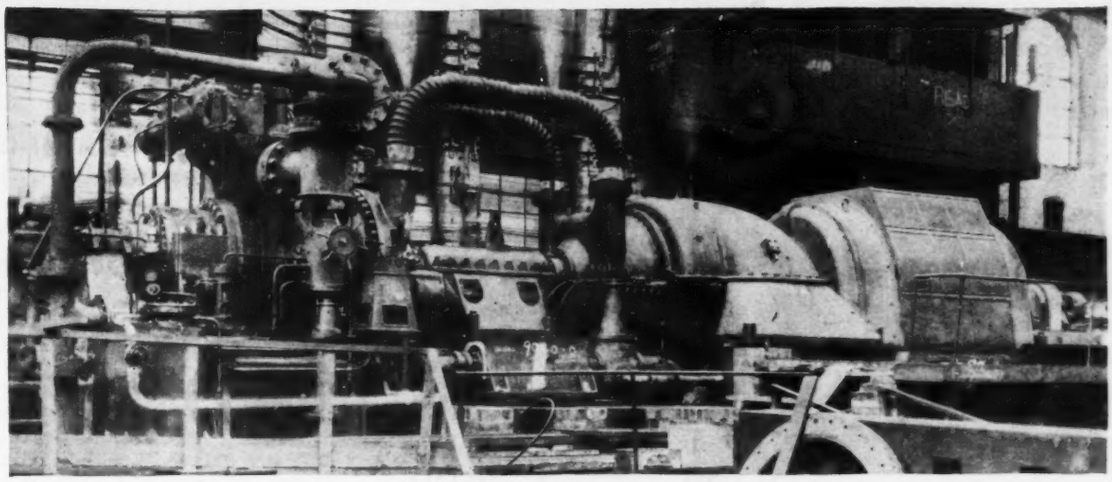
WELDING A FLOOR AUTOMATICALLY



Although an attendant is here seen watching a General Electric machine welding a "battledeck" floor for a Pittsfield (Mass.) garage, the process is automatic and the machine can be left to its own devices for stretches of time.

BRITISH THOMSON-HOUSTON UNIT USES STEAM AT 1,000 DEG.



A long forward step in the exploration of steam-turbine possibilities is taken by this 10,000-kw. turbine in the new Delray station of the Detroit Edison Company. As stated in the ELECTRICAL WORLD *for August 30 (page 379), the machine will operate at a steam temperature of 1,000 deg. and pressure of 400 lb. The picture shows the turbine set up for test in the Rugby works of the British Thomson-Houston Company, where it was built.*

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investment; that such proposed agreement "is oppressive and deprives the applicant for a license of its day in court and judicial determination of net investment as contemplated by the act," and that "such license should be issued without requiring applicant to enter into any form of stipulation in regard to the time and manner of reaching any such agreement, and that the amount of investment shall be determined only with those provisions of the federal water-power act relating to recapture by the United States."

The applicant filed a statement showing $290,725 claimed as the preliminary cost of the project. The accounting division took exception to items aggregating $82,319, including interest, $29,825; taxes, $1,924; overhead expenses of applicant company, $28,260, and preliminary engineering fees of Henry L. Doherty & Company, $22,309.

The examiner hearing the case gave the solicitor for the commission 30 days in which to file a reply.

▼

Federal Trade Hearings Set for September 29

HEARINGS in the investigation of public utilities by the Federal Trade Commission will be resumed at Washington on Monday, September 29, at the Interior Department Building, the commission's own building having been almost destroyed in the fire of August 30. Two companies of the Electric Bond & Share group will be subject to examination—the Carolina Power & Light Company, a National Power & Light subsidiary, and the Minnesota Power & Light Company, one of the American Power & Light properties. Hearings will be in the financial phase of the investigation. It is probably more than a coincidence that the Federal Power Commission accountants have recently found fault with the pre-license costs filed by both of the operating companies named. The Power Commission accountants' findings are reported on page 462.

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Pacific Coast A.I.E.E. Ends Successful Meeting

THREE papers dealing with railway and industrial electrification and a fourth on forecasting seasonal precipitation were presented at the one remaining business session not covered in last week's report of the Pacific Coast A.I.E.E. convention at Portland, Ore., September 2-5.

Dr. A. F. Gorton told of the work being done at the Scripps Institution of Oceanography at La Jolla, Calif., to establish the value of ocean surface temperatures as a short-range indication of precipitation. Considerable faith seems justified. The work is of unusual interest to power companies since they can predict run-off if precipitation can be forecast.

Two good student sessions were held on Thursday and Friday. Entertainment and inspection trips rounded out a most successful convention for the 300 who attended.

Boulder Dam Ceremony Set for Next Wednesday

BOULDER DAM construction will be officially begun on Wednesday, September 17, by a ceremony at the dam site presided over by Ray L. Wilbur, Secretary of the Interior, with members of his staff and Western governors, senators and other public officials. Dr. Wilbur will broadcast. Without marking an actual turning point in the enterprise, this event will give due recognition to a project of such size and importance as a national rather than a local undertaking.

Selection of a project town site has been made, according to Dr. Elwood Mead, Commissioner of Reclamation, at an elevation of 2,500 ft. It will be 6 miles from the dam and may soon have a population of 5,000. For the construction of a railroad from Las Vegas, Nev., 17 miles away, to the new town bids have been opened by the Union Pacific Railroad, which will operate this spur line.

Bids for preliminary power will be opened on September 26. The Bureau of Reclamation has estimated the cost of a power house on the spot, but is getting bids on the basis of delivery from an operating company. The Southern Sierras Power Company and other subscribers for Boulder Dam energy are expected to make offers on the basis of building a transmission line for delivery of power to the site with the idea that the same line can be used to transmit outgoing power from the completed project.

Damage to Power Plants in Santo Domingo Disaster

CABLE messages received by the Southern Cities Utilities Company of Philadelphia, controlling through the Islands Gas & Electric Company the Compañia Electrica de Santo Domingo, from W. H. Davidson, resident manager of the last named, indicate that the damage done to the electric system of the island during last week's hurricane was much less than was at first expected and was mostly confined to the city of Santo Domingo.

Properties in the northern part of the island were not touched by the storm and electric service was uninterrupted, the reports says. In the southern part service was off for less than two hours in La Romana and San Pedro de Macoris. Damage of about $25,000 was done within the capital, which is fully covered by insurance. Street lamps in the capital were lighted again this week and emergency lighting service instituted. The generating capacity of the Santo Domingo city plant is 5,218 kva.

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Tennessee University's New Technical Building

REPRESENTING an investment of $250,000 and increasing the capacities of the engineering college of the University of Tennessee nearly 50 per cent, the new electrical and hydraulic engineering building at Knoxville will be ready September 18. Prof. C. E. Ferris, dean of the engineering department, expects an enrollment of about 600. The new building is 300 ft. long, four stories in height, and follows the general architectural lines of other structures on the grounds overlooking the Tennessee River. It is intended ultimately to flank the structure on either side with buildings of the same type but smaller.

▼

Lighting Experts Take Architectural Course

CO-OPERATION between the architect and the illuminating engineer was furthered this week by concurrent courses of lectures given respectively at the headquarters of the Architectural League of New York, under the auspices of the School of Architecture of Columbia University, and at the Art Institute in Chicago, under the guidance of the architectural schools of the University of Illinois and the Armour Institute. Registrations were limited to 75 at New York and 100 at Chicago, and lighting engineers and specialists, members of the Illuminating Engineering Society, were the registrants. L. A. S. Wood of the society just named was chairman of the committee that arranged the courses.

The courses consisted of two lectures each day for five days by professors of architecture of the respective educational institutions. These lectures covered the fundamentals of architecture and allied subjects, and they were supplemented by visits of inspection. Prominent architects were to give final talks at luncheon on Saturday.

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Findlay (Ohio) Utility Seeks to Expand

THE recently organized Central Ohio Power & Light Company of Findlay has asked the Ohio Public Utilities Commission for authority to purchase the Toledo, Bowling Green & Southern Traction Company's power and light properties for $2,148,800, the Western Ohio Railway & Power Company's power and light properties at Lima for $1,736,500, the Wooster Electric Company for $1,085,000, the North Baltimore Service Company for $97,800, the Farmers' Light & Power Company of Venedocia for $90,300, the Enterprise Utilities Company of Toledo for $64,900, and the Rudolph Light & Power Company for $11,500. All these are Ohio properties. The Findlay company also asked authority to issue and sell $3,600,000 of 5 per cent bonds, 12,000 shares of preferred stock at $90 and 22,300 shares of common stock at $50 in order to finance the purchase. Hearing on the application is set for September 17.

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Wisconsin Commission's New Merchandising Rule

DISALLOWING the contentions of electric and gas utilities that a considerable part of the costs relating to the sale of merchandise are incurred for the purpose of promoting the sale of a company's utility service or product, the Wisconsin Railroad Commission has entered a formal order in which it states that it believes that it was the intention of an act passed by the Legislature of 1929 that there should be charged to the merchandising business all costs associated with the conduct of that business.

The formal order of the commission is made effective January, 1931. It requires the utilities to set up a new accounting system which shall conform with the law passed by the 1929 Legislature, thus compelling companies to keep separate accounts to show all profits or losses resulting from the sale of appliances or other merchandise. No such profit or loss will be taken into consideration by the Railroad Commission in arriving at any rate to be charged for utility service. Contract and jobbing work is also included in the new accounting order.

Where lamp renewals are made for customers without specific charge, or at a price less than the price charged to parties not entitled to lamp-renewal allowances, the lamp renewals will not be treated as merchandise.

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Why Put on the Brakes?

ELECTRICAL equipment manufacturers are holding up the Census of Manufactures for 1929. Most of them have sent in their reports, but some two hundred have not, according to word received from Washington.

This handful is preventing the compilation and publication of the results. It is nullifying the efforts of 1,500 other electrical manufacturers and of the Census Bureau to get out statistics promptly.

Industry needs the census figures. Anything that delays their publication puts brakes on business recovery. This year, if ever, we need to know where we stand.

Send your figures to Washington!

Model Rural Section Part of British Electric Plans

NEGOTIATIONS are being conducted in England for an intensively electrified demonstration area of about 100 square miles in rural Norfolk. This will be established in connection with the east England grid scheme adopted at the beginning of August by the Central Electricity Board. The district includes the market town of Reepham.

Electricity will be specially supplied from the Thorpe station of the Norwich Corporation, which is one of the two selected generating stations of the east England grid scheme. Farms, workshops and cottages in the selected area will get the supply at a specially low figure, and the district will, it is predicted, be placed "at least five years ahead of the times." Power will be made available by overhead lines, the initial cost of which will be borne by

the corporation of Norwich, which is aiming to make this district a model of scientific industrialized agriculture. Village streets will be lighted from the same source, and wherever possible poles and overhead wires will follow the valleys and be screened by trees to preserve the beauty of the countryside.

The east England section of the national grid scheme is the smallest of the eight zones covering England and Wales and a part of Scotland, and its adoption means that the "grid" is now complete for England and Wales on paper. In Norfolk and Suffolk Counties there are eleven generating stations, but under the new scheme these, as just implied, will be reduced to two—those at Great Yarmouth and Thorpe, Norwich. The proposed developments in this area, encircling 3,438 miles, will call for an expenditure in the next seven or eight years of $4,500,000 for supply equipment.

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Warm Fight in Georgia Over Crisp County Plant

A TEMPORARY injunction was granted to the Georgia Power Company in the Fulton County Superior Court last week restraining the Georgia Public Service Commission from forcing the company to show cause why rates should not be reduced throughout the state in accordance with its rate reductions in Cordele and Crisp County. The commission's order was issued after citizens of Crisp County had complained that the Georgia Power Company had lowered its rates below those put into effect by the new Crisp County power plant.

In its reply, as set forth in the petition for injunction, the Georgia Power Company contends that the Crisp County plant offers unjust competition, since it is not subject to regulation of rates and practices and since its rates do not have to be uniform but may vary with each customer. The company maintains that the lowered rates of the Crisp County plant jeopardize the company's investments in that district. The petition also avers that the Georgia Public Service Commission has no power to fix minimum rates, but only maximum rates, on power within the state. The company will seek to have the injunction made permanent on September 29 in the Circuit Court of Fulton County.

The Municipal Utilities Rate Association of Georgia, embracing many cities and towns, has pledged its support to the Crisp County officials and will become a party in the case. This association has appointed Dr. John J. Bauer as rate expert. James A. Perry, chairman of the commission, sees in the Georgia Power Company's action "an effort to get rid of the jurisdiction of the commission—a determined effort on the part of all utility companies throughout the country to centralize jurisdiction over purely local state matters at Washington."

BERLIN'S LATEST GENERATING PLANT

—Henry Miller Service.

The new power house on the outskirts of the German capital—the Westwerke—is rated at 228,000 kw. and will provide a substantial addition to the city's supply of electrical energy.

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Insull Interests Enter Manitoba Territory

UNDER the name of National Utilities, Limited, the Samuel Insull interests of Chicago have entered the Manitoba public utilities field. The National Utilities has already acquired municipal power services at several points and is said to be negotiating with other municipalities to obtain franchises. Until quite recently National Utilities, Limited, was a subsidiary of Canadian Terminal Systems, Limited. This spring, however, the company was acquired by the Middle West Utilities Company of Canada, which in turn is controlled by Insull, Son & Company of Canada, with headquarters in Montreal. The president is J. A. McPhail, vice-president of the Great Lakes Power Company, Sault Ste. Marie, Ontario, of which Samuel Insull is president.

New Hampshire Utilities Under State Inquiry

INVESTIGATION of the financial structure and control of the New Hampshire Gas & Electric Company and the Derry Electric Company, subsidiaries of the New England Gas & Electric Association, by the New Hampshire Public Service Commission has just been opened. Both operating companies have offices at Portsmouth, N. H., but headquarters of the New Hampshire Gas & Electric are at Cambridge, Mass.

The commission's original order for the investigation included also the New England Gas & Electric Association and the Associated Gas & Electric Company, but, as already published, an injunction against the commission was issued by a United States court restricting the commission's inquiry to those companies which operate as public utilities within the state.

Documentary exhibits were filed at the first hearing, giving detailed statements of construction, management, purchasing and commission fees paid by the New Hampshire companies to various corporations in the fields indicated. They showed that the New Hampshire Gas & Electric Company paid out more than $109,000 for such fees during 1927, 1928 and 1929, while the Derry company paid fees of $18,597 in the same period.

Economics, Sales and Public Relations Occupy Pennsylvania Meeting

LEADING off the fall N.E.L.A. conventions with an attendance of more than 400, the Pennsylvania Electric Association met, as usual at Bedford Springs, on September 3 to 5. A good program was carried out, and the sports and entertainment features were unusually attractive.

Public relations, sales, rates, economics and engineering were among outstanding topics treated by authoritative speakers. W. A. Jones, president of the National Electric Light Association, stressed two outstanding problems. He pointed out that in 1922 $4.72 was invested for each dollar of annual gross revenue and that by 1929 this investment had increased to $5.64, an increase of 19 per cent. In the same period the rate per kilowatt-hour decreased 8 per cent. About 8,000,000 of the 20,000,000 total domestic customers were non-profit customers, he said, and probably 6,000,000 were served at an actual loss. The service charge plus greater usage was the only means for changing this economic situation. The second problem was the time-proved necessity for a public understanding of the industry. This could be gained only by perseverance in disseminating facts to the employees and to the public.

James L. Madden, vice-president of the Metropolitan Life Insurance Company, also stressed public relations. He said no industry could succeed unless these were sound and pointed out that the structure of industry today is corporate and utterly changed from that of a few years ago. All corporations are interdependent as regards public relations and have a mutual interest in the matter. Advertising and the printed word are useful agents in putting forth industry facts, but the speaker held that there is no substitute for personal contact. Every employee of a corporation from the president down should be public-relations-minded.

Harry Reid, chairman of the N.E.L.A. Public Relations National Section, also stressed the importance of the employee in developing public relations. Organized effort must be had to get each employee informed on industry topics, and intensive effort in educational projects for employees is imperative.

Paul S. Clapp, managing director of the N.E.L.A., dwelt upon the stability of the industry during the recent industrial depression, its co-operation in sustaining business by expenditures for construction and the lowering of rates despite increased investment. He showed the opportunity for greater domestic sales and gave an encouraging report on the work of the association.

Many other excellent addresses were made. G. S. Merrill showed graphically the effect of voltage variations on the life and revenue to be obtained from lamps, G. E. Whitwell discussed the trends and developments in purchased-power markets, C. E. Greenwood stressed the importance of selling, F. B. Saunders talked of labor-saving devices in accounting and billing, L. W. W. Morrow dwelt upon utility system planning, and Chester Leasure discussed the importance of public relations. An address by Dr. M. S. Viteles showed the application of psychological tests to the choosing of substation operators. F. K. Glynn gave a good talk on the handling and selection of motor vehicles as developed by the Bell System.

President John F. Ford reviewed the work of the year and reported very satisfactory utility conditions in Pennsylvania. N. G. Reinicker was chosen as the next president of the association.

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Nebraska Farmers Give up Public Power Scheme

SAUNDERS COUNTY (Neb.) farmers who have sought repeatedly over a series of years to frame legislation that would circumvent the constitutional inhibition against the Legislature delegating its powers to private indi-

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LIGHT AND POWER EXECUTIVES LOOK ENVIOUSLY AT DIRIGIBLE

Left to right—L. G. Tighe, manager Akron division Ohio Edison Company; Thomas W. Martin, president Commonwealth & Southern Corporation; Paul E. H. Leroy, treasurer Goodyear; Bernard C. Cobb, chairman Commonwealth & Southern; W. H. Foster, director Ohio Edison; C. S. McCalla, manager Youngstown division Ohio Edison; F. P. Cummings, vice-president Commonwealth & Southern; W. L. Wilkie, of counsel, Commonwealth & Southern; M. W. Arthur, vice-president Ohio Edison; A. C. Blinn, vice-president and general manager Ohio Edison, and E. A. Yates, chairman of the board, Allied Engineers, Inc

Although probably no light and power company has yet substituted a dirigible for its general-purpose airplane, utility men touring Ohio and Michigan properties recently found that the hangar of the Goodyear Tire & Rubber Company at Akron, Ohio, where the "world's largest" lighter-than-air flying ship is being constructed, made a good background for a group photograph.

viduals and groups, only to meet with failure through adverse court decisions, have abandoned their efforts to establish electric power districts with authority to build plants or distribution systems and to mortgage property within their limits. The Farmers' Co-operative Electrical Company of Wahoo, a stock corporation with $50,000 capital, has been authorized by the state to take over the property built before the validity of the district law was attacked.

▼

Propose Exchanging Power for Water with Mexico

ONE of the interesting features of the report which the International Water Commission recently made to President Hoover in regard to adjusting international water rights of the Rio Grande between Mexico and the United States is the recommendation that large quantities of electric power, to be generated at dams to be constructed on the Rio Grande, be given to Mexico in exchange for part of its share of the river's water for use in irrigation on the American side. W. E. Anderson of San Benito is consulting engineer of the commission. The report says:

"If Mexico would prefer to receive more electric power and release to the United States more water, it is thought such an arrangement would be beneficial to the United States. It is also felt that if Mexico should be willing it would be beneficial to the United States to construct a power plant for Mexico in exchange for unappropriated water from Mexican sources. Such need as Mexico may have for additional water above Fort Quitman may also be met by an exchange of water with the United States."

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Third Power Tube Is Launched at Matanzas

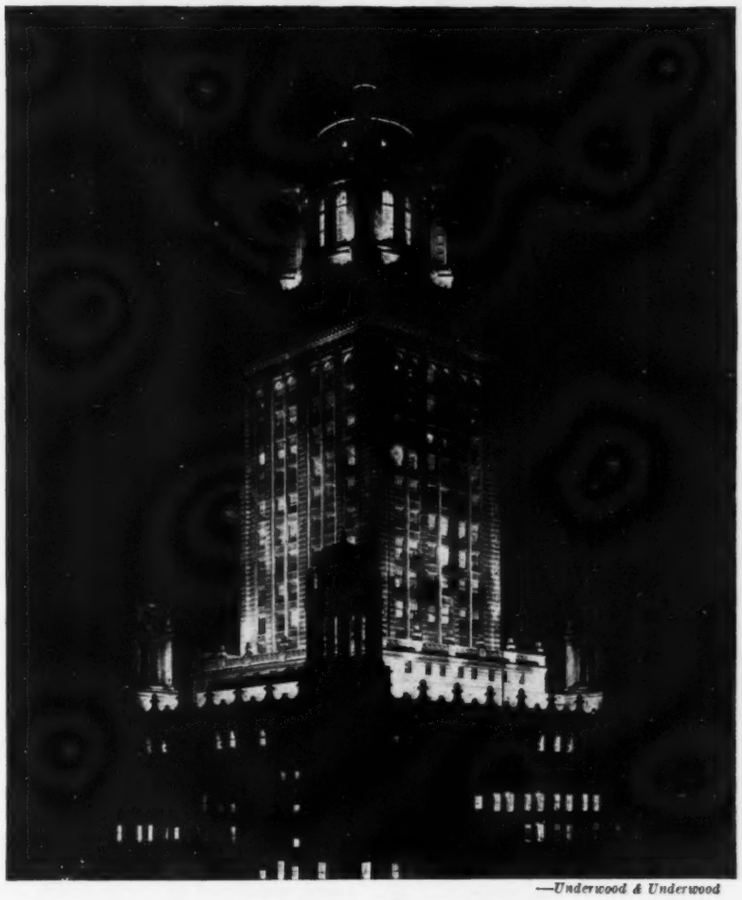
NOT daunted by two failures, Georges Claude, French engineer and scientist, superintended on September 7 the launching at Matanzas, Cuba, of a third tube designed to produce cheap electrical energy from Gulf Stream waters. The difference in temperature between the lower and upper currents, he believes, can be utilized in driving a turbine, the surface water being converted into steam by passing through a vacuum and the steam being recondensed by the cold water below.

The two previous tubes were both destroyed in launching, the second one less than three months ago (ELECTRICAL WORLD, June 28, page 1316, and July 5, page 3). This time, with the aid of the Cuban government, success appears to have rewarded perseverance. Three hundred workmen and about 40 expert native swimmers were employed to launch the tube under M. Claude's supervision. A dozen tugboats, a government destroyer, two companies of troops and squads of provincial police asissted in the task.

The 1,500-meter tube, built of corrugated steel, about 6 ft. in diameter, was towed out to sea by the tugs and was kept afloat by means of tanks of compressed air attached along its sides. As the last segment rolled down the narrow-gage railroad into the harbor, the signal was given and two men with acetylene torches cut through the winch cables holding the great structure to the shore.

The tube is an experimental one. If the tube fulfills the designer's expectations, he intends to build and submerge a tube of six times the diameter and work on a much larger scale.

CHICAGO'S RESPLENDENCY BY NIGHT



—Underwood & Underwood

One of the many notable examples of floodlighting in Chicago is that of the Pure Oil Building tower—a comparatively recent installation. It is at Wacker Drive and Wabash Avenue.

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Brooklyn Edison's Wires Buried at Huge Cost

NO LESS than $20,600,000 will be the cost this year of putting the distribution wires of the Brooklyn Edison Company underground—a task which the company's engineers hope to finish by January. It has been pushed vigorously all over the borough, having been considerably facilitated by excavations for a new subway. About 60 per cent of the sum named, which was allotted in the 1930 budget, has already been expended.

The improved appearance of the streets as a result of the elimination of overhead wires and poles and the increased value of neighboring real estate are cited by the company as compensating for any temporary inconvenience occasioned by its excavations. So far as possible the work has been done in advance of or in conjunction with public improvement and pavement projects to avoid future street openings.

Sloan's Testimony at Rate Hearing Deferred

PRIMARY emphasis is placed by the city of New York in its opposition to the Edison companies' proposed rate reduction on the contention that the introduction of the service charge will increase the bills of over 52 per cent of the residential customers by an average of 27 cents per month. At the Public Service Commission's hearing on September 5 the company maintained that 74.5 per cent of the energy would be sold at a lower average rate and that only 24.5 per cent of all customers would pay a higher average rate per kilowatt-hour. In the case of the commercial rate only 29.9 per cent of the customers would have their bills increased.

The rate was admitted to be a promotional one. Corporation Counsel Hilly, for the city, asserted that its real function was to exclude submetering from the New York situation and that the innocent bystander was being made the victim of the quarrel between the Edison group and interloping submetering companies.

Mr. Hilly, in the course of a cross-examination of Robert B. Grove, secretary United Electric Light & Power Company, who had testified at a previous session, pointed out alleged discrepancies in Mr. Grove's figures about the number of "zero" bills and inquired into the reasons for omitting from the schedule any provision for prompt-payment discount and some form of off-peak rate for residential and commercial customers.

The coal clause, involved in a separate proceeding, was casually mentioned after the company had filed data showing that the average busbar cost of generation had been decreased from 0.56 cent per kilowatt-hour in 1928 to 0.48 cent for the first six months of 1930, the allocation of this cost being as follows:

	1928	1930*
	—Cents—	
Superintendence and labor	0.10	0.09
Power plant supplies and expenses	0.38	0.32
Maintenance of power plants	0.08	0.07
Total for 4,210,732,505 k.w.-hr.	0.56	
Total for 4,860,887,508 k.w.-hr.		0.48

*Six months

The next hearing will be held September 22, when President M. S. Sloan, who was not called at last week's session, is expected to take the stand and testify on questions of company policy.

▼

Ontario Farm Lines Increase by 1,600 Miles

ELECTRIFICATION of Ontario farms by the provincial Hydro-Electric Power Commission proceeds rapidly, and the latest monthly report announces that this year's construction program has almost been completed. For 1930 it was planned to build 1,434 miles of primary power lines to serve more than 8,500 rural customers. So far 1,432 miles have been constructed, and during July 682 applications for rural services were received. These will necessitate another 183 miles of line. The cost of the 1930 construction program is estimated at $3,250,000.

Municipal Plant for Portland, Ore.?

FOR the purpose of investigating the possibilities of establishing a municipal power system in the city of Portland, Ore., the City Council has agreed to place in the 1931 budget an item of $25,000. Mayor George L. Baker has requested the city engineer, the city attorney, the engineer of the Water Bureau and the city statistician to gather the data. A similar amount for the identical purpose was placed in the budget last year, but disallowed by the Tax Conservation Commission.

▼

Fast Work on Maine High-Tension Line

RAPID construction marks the progress of the 68-mile 110-kv. transmission line from the Wyman Dam development of the Central Maine Power Company to Bucksport, where it will supply coastal territory, including a large plant being built by the Maine Seaboard Paper Company. It is to be a single-circuit H-frame line and will cross the Penobscot River on five steel towers, the two suspension structures being 247 ft. high and supporting a 1,680-ft. span. The line, which has been progressing at the rate of a mile a day since early in August, will be ready for operation late this fall. It will be interconnected with lines of the Cumberland County Power & Light Company and the Bangor Hydro-Electric Company.

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CHICAGO'S TECHNICAL MUSEUM WILL COST $5,000,000

—Field Museum Photo

JACKSON PARK, Chicago, is witnessing the birth of a National Museum of Science and Industry on the site of the old World's Fair Fine Arts Building there, of which it is to be an exact replica in stone. Its cost will be $5,000,000, and Julius Rosenwald has endowed it with $3,000,000 and pledged himself to pay any excess over the estimated expense of building. By the end of 1932 the museum should be open to the public, with 400,000 sq.ft. allotted to the major sciences and to multifarious phases of engineering and industry.

The history and development of electricity will have a prominent place, and, as in the case of other branches of engineering, the exhibit will not be merely a storehouse, but machines will move and processes be exemplified. The benefits of interconnection and of motors in the home and on the farm as well as in the factory will be made clear, and statistical information will be presented in models, charts and motion pictures.

Nearly a million dollars' worth of exhibits have already been donated to the museum, and it is estimated that in ten years it will house exhibits worth fifty times that sum.

Diablo Dam Turned Over to City of Seattle

MARKING the completion of three years' work, Diablo Dam, the city of Seattle's great structure across the Skagit River, was turned over to Seattle city officials by L. S. Oakes, president of Winston Brothers Company, which built the dam, at a formal dedication on August 27. The dedicatory ceremony, participated in by city officials and 300 prominent citizens, was held on the 1,180-ft. crest of the dam, which rises 389 ft. above bedrock.

Preliminary work on the Diablo Dam, which impounds water in the Diablo reservoir extending 6 miles upstream to the site of the proposed Ruby Dam and containing 90,000 acre-ft. storage capacity, was started September 27, 1927. The initial installation will provide for 167,000 hp., and the ultimate capacity will be 225,000 hp. The ultimate cost, including the present dam, proposed power house and transmission lines, is estimated at $11,000,000.

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Coming Meetings

International Association of Electrical Inspectors — Western Section, Congress Hotel, Chicago, Sept. 15-18. W. S. Boyd, 175 Jackson Blvd., Chicago. Eastern Section, Pittsfield, Mass., Sept. 22-24. R. Walker, 85 John St., New York.

Empire State Gas and Electric Association—Saranac Inn, N. Y., Sept. 18 and 19; Meter Section, Watertown, N. Y., Oct. 9 and 10. C. H. B. Chapin, Grand Central Terminal, New York.

American Welding Society — Congress Hotel, Chicago, Sept. 22-26. M. M. Kelly, 29 West 39th St., New York.

Great Lakes Division, N.E.L.A.—French Lick Springs, Ind., Sept. 25-27. T. C. Polk, 20 North Wacker Drive, Chicago.

American Electrochemical Society — Hotel Statler, Detroit, Sept. 25-27. C. G. Fink, Columbia University, New York.

National Safety Council—Pittsburgh, Sept. 29-Oct. 4. W. H. Cameron, 20 North Wacker Drive, Chicago.

New England Division, N.E.L.A.—New Ocean House, Swampscott, Mass., Sept. 29-Oct. 1. Miss O. A. Bursiel, 20 Providence St., Boston.

Illuminating Engineering Society — Hotel John Marshall, Richmond, Va., Oct. 7-10. E. H. Hobbie, 29 West 39th St., New York.

American Institute of Electrical Engineers—Middle Eastern District, Philadelphia, Oct. 13-15; Southern District, Louisville, Nov. 19-22. F. L. Hutchinson, 33 West 39th St., New York.

American Engineering Council — Administrative Board, Mayflower Hotel, Washington, Oct. 17 and 18. L. W. Wallace, 26 Jackson Place, Washington.

Rocky Mountain Division, N.E.L.A.—Franciscan Hotel, Albuquerque, N. M., Oct. 20-22. O. H. Weller, Public Service Co. of Colorado, Denver.

National Electrical Manufacturers' Association — Chamberlain-Vanderbilt Hotel, Old Point Comfort, Va., Oct. 20-24. A. W. Berresford, 420 Lexington Ave., New York.

National Electrical Wholesalers' Association—Pittsburgh, Nov. 10-14. E. Donald Tolles, 165 Broadway, New York.

National Association of Railroad and Utilities Commissioners — Charlotte, N. C., Nov. 12-15. J. B. Walker, 270 Madison Ave., New York.

Standard Specifications for Wiring Published

STANDARD electrical specifications for office buildings, including stores, show windows and other related spaces, have recently been published by the Electric Association, Chicago. The compilation is the work of a committee in the association whose membership included architects, contractors, manufacturers, utility men and building operators. The result is a comprehensive statement of requirements that should be of definite value in the effort to make electrical installations adequate to modern demands. Insufficiency of outlets and of current-carrying capacity has long characterized office building wiring and still does so to a great degree. This specification is said to be the first concrete attempt yet made to raise the capacity standard of such installations.

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Britain Preparing for Faraday Celebration

STEADY progress is being made by the committees appointed by scientific and electrical bodies in Great Britain to prepare plans for the celebration in 1931 of the centenary of Michael Faraday's epoch-making experiments, on the results of which the science of electrical engineering has been so largely reared. The Royal Institution and the Institution of Electrical Engineers are sponsoring the project, in which about thirty associations will participate.

The approved program as so far arranged includes, as regards the part of the Royal Institution, a reception to delegates to be selected by representative institutions throughout the world, to be held at the institution on September 21; a commemorative meeting at the Queen's Hall in the evening of the same day, with discourses on Faraday's work; a conversazione on September 22, and other social functions. The Institution of Electrical Engineers will hold electrical conferences of its members and those of sister associations and will also organize a Faraday exhibition, to be held in Albert Hall from September 23 to October 3, 1931, and to be open to the public. This will be participated in by chemical as well as electrical bodies and will illustrate the whole range of Faraday's achievements.

DIABLO DAM SPILLWAY

—P.&A. Photos.

Water from Diablo Dam, Seattle's new municipal development, will be used a second time, 10 miles farther down the canyon. A view of the completed dam was shown last week (page 418).

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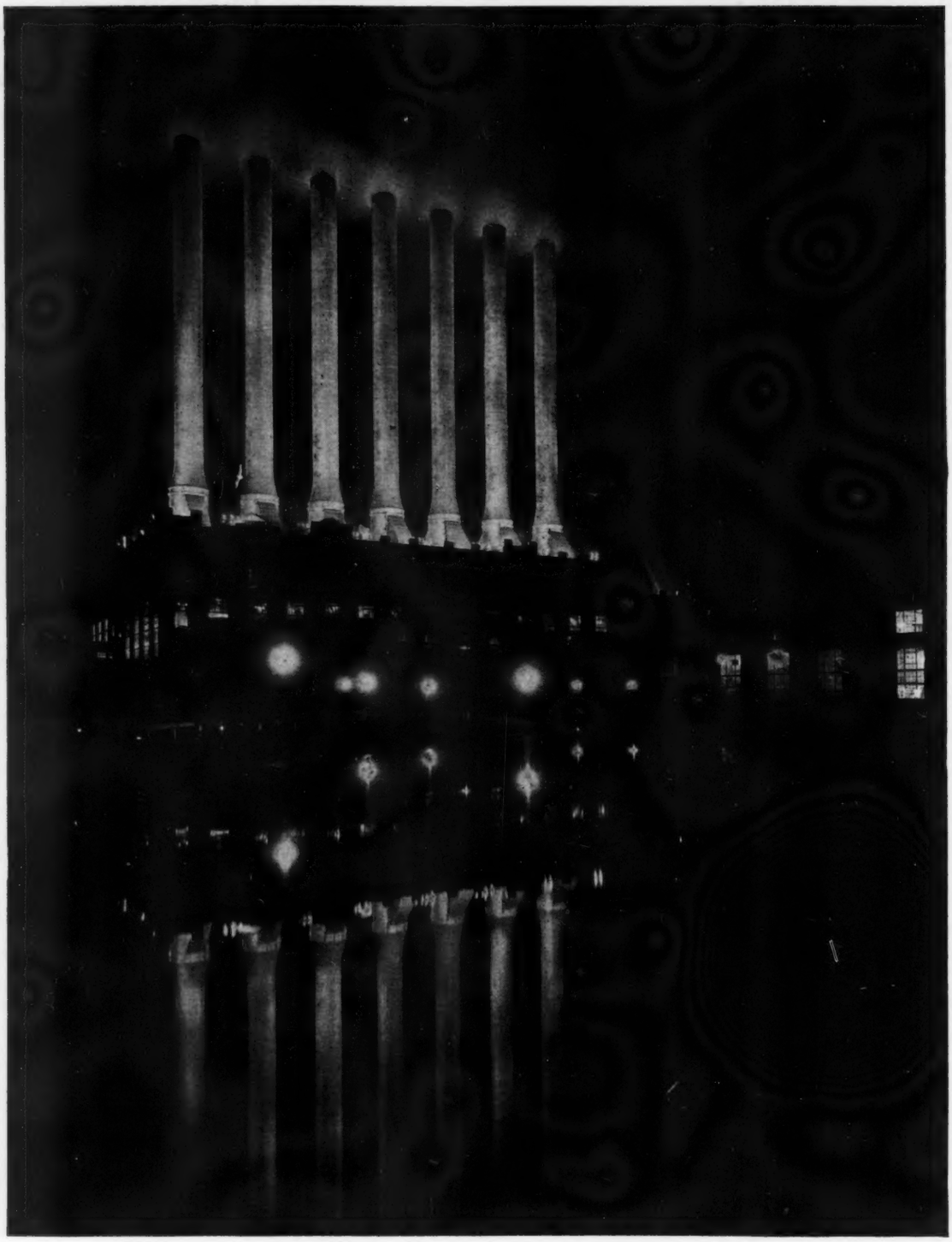
Trustees Will Dedicate Memorial to Westinghouse

DEDICATION of the memorial to George Westinghouse made possible by appropriation and subscription among 60,000 employees of the industries which bear his name will take place on October 6, it has been announced by A. L. Humphrey, chairman of the Westinghouse memorial trustees. Leaders of industry, science, art and education will attend the unveiling in Schenley Park, Pittsburgh, of a bronze group of heroic proportions sculptured by Daniel Chester French. Henry Hornbostel of Pittsburgh designed the setting for the memorial, the Piccarelli brothers of New York constructed the models of the various units for casting, and Paul Fjeldi designed the six panels depicting the great achievements of Mr. Westinghouse as inventor and industrialist. The main unit of the memorial rises twenty feet from a Norwegian granite base and includes a dominating figure of Westinghouse in the prime of his life.



DETROIT'S TRIBUTE OF LIGHT—Floodlighting at the Connors Creek plant of the Detroit Edison Company, undertaken during Light's Golden Jubilee, has been retained as a permanent tribute to Thomas A. Edison

EDITORIALS

L.W.W.MORROW
Editor

The Electrical Guild of North America

SIXTY-THREE firms engaged in the electrical construction business in nineteen cities have organized an association called the Electrical Guild of North America. It is the guild's published intention to promote industrial co-operation in this field "on a scale hitherto unknown and untried" by the prevention of strikes and lockouts "through open understandings with union labor" and an active co-operation with the International Brotherhood of Electrical Workers. A research bureau is to be opened in Washington to work for the stabilization and development of the electrical construction industry and the adjustment of difficulties between employer and employee through the Council on Industrial Relations. L. K. Comstock, who heads the Council on Industrial Relations, is president of the new organization. The guild therefore takes its place among the national associations of the electrical industry as a champion of industrial progress through the promotion of industrial peace based on a common understanding of the economics of practical co-operation.

The history of the relations of the electrical construction industry with labor has followed the course of evolution in other fields. Beginning with intolerance and organized conflict, it has gradually worked forward toward understanding and co-operation as the force of economic truth has borne down upon men's minds. The Council on Industrial Relations has been of late years an active influence in this direction. For without regard to any man's preference toward the employment of union or non-union labor, or whether employer or employee has most benefited by the decisions of the council so far, the establishment of an orderly procedure in the discussion of disputes with labor has been a fine contribution to progress. It simply recognizes the principle that reason is more effective than strife for maintaining justice in controversies based on provable facts.

The work of the guild will be watched with keen interest by electrical men. Mr. Comstock is to be congratulated upon the opportunity which comes to him in this further adventure in the organized exploration of industrial relations. He is also to be complimented upon his courage in undertaking it.

A Word of Warning

THE downward trend of unit gross income in the light and power industry received the attention of President W. A. Jones of the N.E.L.A. in his address before the Pennsylvania Electric Association last week. He uttered a word of warning and gave a constructive suggestion. In the opinion of Mr. Jones, light and power companies should have broad policies as to service and extensions, but these policies should meet the economic tests.

Two facts stand out. The investment per dollar of gross revenue has increased from $4.72 in 1922 to $5.64 in 1929 and about eight million of the twenty million domestic customers are non-profit customers. Every effort should be made to halt and to change the bad economic trends and yet retain a constructive policy on rates and extensions.

The economic protection of the utilities against the "convenience" type of domestic user is a service charge of some kind. But, Mr. Jones insists, this is not the most satisfactory solution of the problem. These non-profit customers should be made profit customers. This can be done only through the sale of more appliances. Why should not every utility company focus upon encouraging

greater use of electric service through greater sales of appliances? Commercial development of business, with adequate rate forms, is the way to insure that broad service policies shall have economic merit.

Shaping the Rates to Mold the Load

GOOD load factor is not necessarily the 100 per cent load factor resulting from a uniform twenty-four-hour load. Accommodation of sizable industrial loads to the over-all economics of the interchange of power on an interconnected system may well dictate a deliberate distortion of such loads and the consequent sacrifice of a "good" load factor.

Experience here and there has shown that industrial loads are not wholly inflexible. Certain operations can readily be concentrated in the night hours with only slight shift of the working forces. Those processes which employ more power than labor lend themselves most agreeably to such change in scheduling. Very often this can be done without disturbing the flow of materials or occasioning any real problem of accumulation, handling or storage.

It is natural that industry should move in this direction only on the incentive of power charges that make the inducement economically attractive. Instances are coming to light where such rates have been devised which apply to the industrial user the same distinction between firm power and excess power that has been the basis of energy interchange between steam and hydro sources. The differential between the demand and energy charges for firm and for excess power may easily justify a molding of system load so as to release local capacity for supply to the interconnection at periods when the revenue or acquired credit will be advantageous. Such procedure looks lucrative whenever the taking of interconnection power at times of local peaks hinges on the credit attained for power supplied at other times toward the interconnection peak.

Attainment of this profitable interchange may well depend upon shaping the local load so that the system may be in a position to control its interchange operations. The whole possibility then in turn depends on inducing a molding of large industrial load curves to such shape as will insure propitious system load curves. Just another case of operating analysis that can effect economies only in the event that the customer is impelled to co-operate by the prospect of sharing savings with the power agency. In fact, it is merely another instance of application of the division of profit with all consumers in an effort to build loads to a point and to a character where every one benefits by the process.

Engineering of State Institutions

THERE are certain people in this country who are strong advocates of the public ownership of power generation and transmission facilities. These people often overlook the fact that the individual states already conduct such enterprises in connection with the various state institutions. While certain states have been fortunate in obtaining the services of a competent engineer or board of engineers to supervise such undertakings, other states have been less fortunate. It would therefore seem in order to suggest to these public-ownership enthusiasts that they should first demonstrate the state's ability to enter the power business by properly building, organizing and operating those plants already under state control.

Many state institutions are placed under some department of the state government in which there is no competent engineering department. The design of engineering plant in the various institutions is left to the architects, while operation and further additions are turned over to the local operating man in charge of the power station.

A recent case comes to mind where the local engineer demanded a new plant for his institution costing $200,000. A casual survey of the present plant, which was not very old, by a competent consulting engineer demonstrated that an expenditure of about $10,000 would fully rehabilitate the old plant and that a later addition of generating equipment costing about $15,000 would meet all needs for at least ten years.

In another case the power plant was furnished by the architects and was found to be wholly in-

adequate. In consequence a complete new plant had to be built with the next addition to the institution. The cost of the first plant was virtually thrown away.

These and other cases that might be mentioned demonstrate the need in every state of a well-paid state engineer or board of engineers, competent and authorized to care for all plants of state institutions and to direct their operation free from political and bureaucratic interference. Much money would be saved in first cost and in operation and many needless mistakes would be avoided. This is a practical phase of public ownership that should receive the whole-hearted support of all citizens.

Positive Action in Public Relations

POSITIVE action is the best method to follow in the cultivation of good public relations, and this requires perspective, alertness and personal contact. Each light and power company is an integral part of a community. Each community has many problems that must be studied and solved by community co-operative action. Since the utility very intimately measures its success in terms of community success, there is every inducement for utilities to co-operate actively in solving community problems and in suggesting improvements for the community or territory.

The community or regional organization for the development of new business enterprises should contain a utility representative. Utility help should be given in studying community zoning, community traffic control, street lighting, water supply, sanitation and smoke abatement. In the schools there is opportunity for studying location of buildings, ventilation, cooking, refrigeration and lighting. There are a host of other positive things to be done in each community. A senior executive officer of each utility can find innumerable things to do in a positive way for the direct benefit of the community and the indirect benefit of the public relations of his utility. These things are not to be bragged about—they are a part of courteous and alert utility service. But they count positively in the sum total of the public relations balance sheet.

Shunted Conductance for Relieving Surges

REACTANCE in the path of a traveling line wave breaks the wave up into reflected and transmitted waves, resulting perhaps in excessive voltage rises and in oscillations. Current-limiting reactors in lines and station buses are not exceptions in this regard, although in the early stages of the study of lightning troubles their importance was not so clearly recognized, nor perhaps so great, as the large values of lumped constants associated with larger elements of station equipment. The tremendous impetus given to the study of lightning disturbances by the development of the cathode-ray oscillograph has, however, made it possible to distinguish the degrees of relative importance and significance of the various elements coming under the influence of the lightning impulse. Such studies have shown that the current-limiting reactors may cause serious oscillations and voltage rises within the station itself.

In order to counteract these disturbances the old and thoroughly sound principle of a shunted conductance has been introduced, and in many instances it has been found economically advisable to install shunt resistors for current-limiting reactances.

No better example of the remarkable accuracy with which lightning impulses and their consequences may now be studied may be found than the admirable paper on this subject by F. H. Kirstead and co-authors which was recently published by the A.I.E.E. In this paper there are reported really astonishing agreement between oscillograph values over a range of a few microseconds and corresponding values computed from the generalized constants of the station connections. Incidentally, the results indicate among other things that oscillations may be completely eliminated by the use of shunt resistors and that the maximum voltage which can occur in the bus may be substantially reduced.

These are important results, but the work is equally if not more conspicuous as an indication that years of patient investigation and study in this difficult field have finally brought its problems to a point where they are susceptible to accurate engineering computation and design.

Electricity Supply in the

THIS article is an epic in copper. Numerous considerations prevented the carrying out of the first contemplated plan of high-voltage distribution with a number of substations feeding a secondary network. Chief of these considerations was the fact that rental from spaces that would be required for substations overbalanced the savings from high-voltage distribution. The result is copper—tons and tons of it. The impressive array of major sizes in the tabulation of conductors gives an idea of the quantity when one just casually scales the lengths of the runs.

By M. G. SEIM

Assistant Electrical Engineer
Graham, Anderson, Probst & White, Architects,
Chicago, Ill.

THE main part of the Merchandise Mart, covering two city blocks, is eighteen stories high, with a tower going up seven additional stories, and has approximately 4,000,000 sq.ft. of floor area. There is a total connected power load of more than 7,000 hp. and a lighting load of approximately 8,000 kw. Locating the transformer and high-tension switch rooms in the basement or on the ground floor, as is the usual practice in most large office buildings, was out of the question, since the Merchandise Mart is one of the first "air rights" buildings in Chicago and the entire area beneath the building is either occupied by tracks of the Chicago & North Western Railway Company or used for teaming space and platforms.

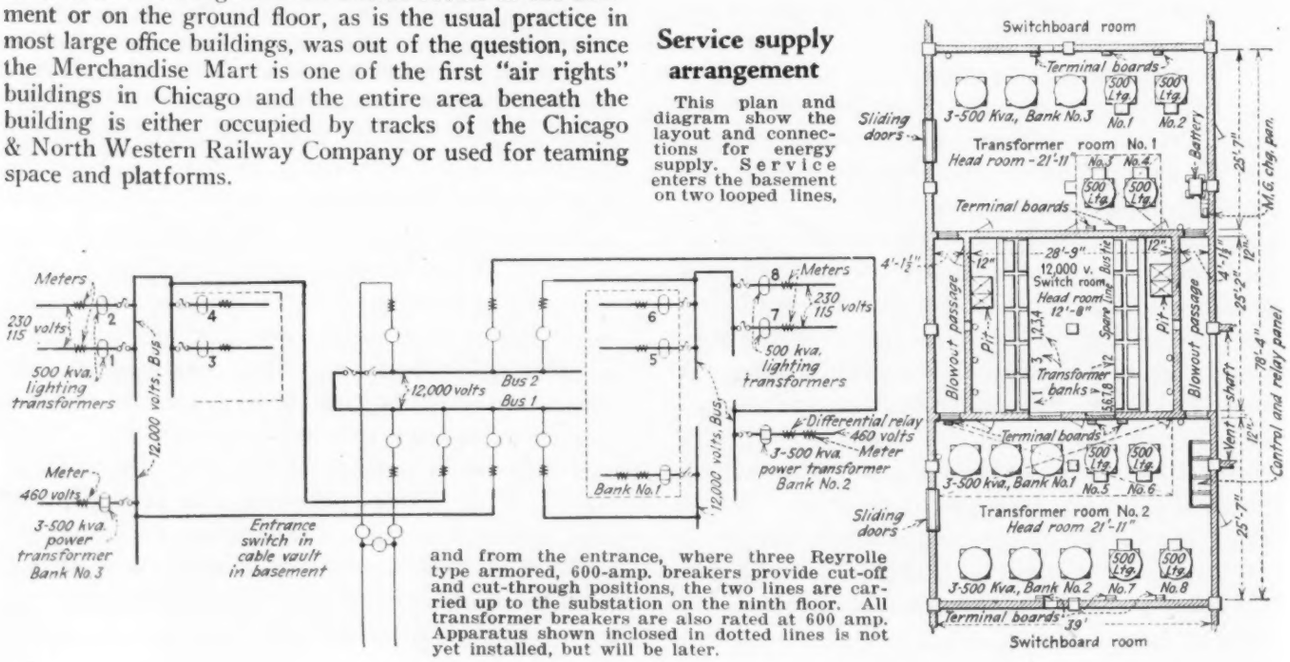
In selecting the location for the transformer and switch rooms, the amount of copper required to keep the voltage loss on the secondary light and power feeders down to a reasonable figure, maximum length of any feeder, rentals which may be realized from space occupied by transformer rooms, floor space available and the extra cost of construction of a number of smaller vaults over one large vault are some of the items that had to be kept in mind. After balancing these items one against another it was found most economical to place two transformer rooms adjacent to one common high-tension switch room located in the center of the building on the ninth floor.

Service cables are brought underground into a high-tension switch room beneath the street on the north side of the building. From this point they are carried beneath the tracks to a point in the center of the building and thence up in a vertical concrete shaft to the switch room on the ninth floor.

A secondary switchboard is located immediately outside of each transformer room, each switchboard serving

Service supply arrangement

This plan and diagram show the layout and connections for energy supply. Service enters the basement on two looped lines, and from the entrance, where three Reyrolle type armored, 600-amp. breakers provide cut-off and cut-through positions, the two lines are carried up to the substation on the ninth floor. All transformer breakers are also rated at 600 amp. Apparatus shown inclosed in dotted lines is not yet installed, but will be later.



World's Largest Building

The Merchandise Mart

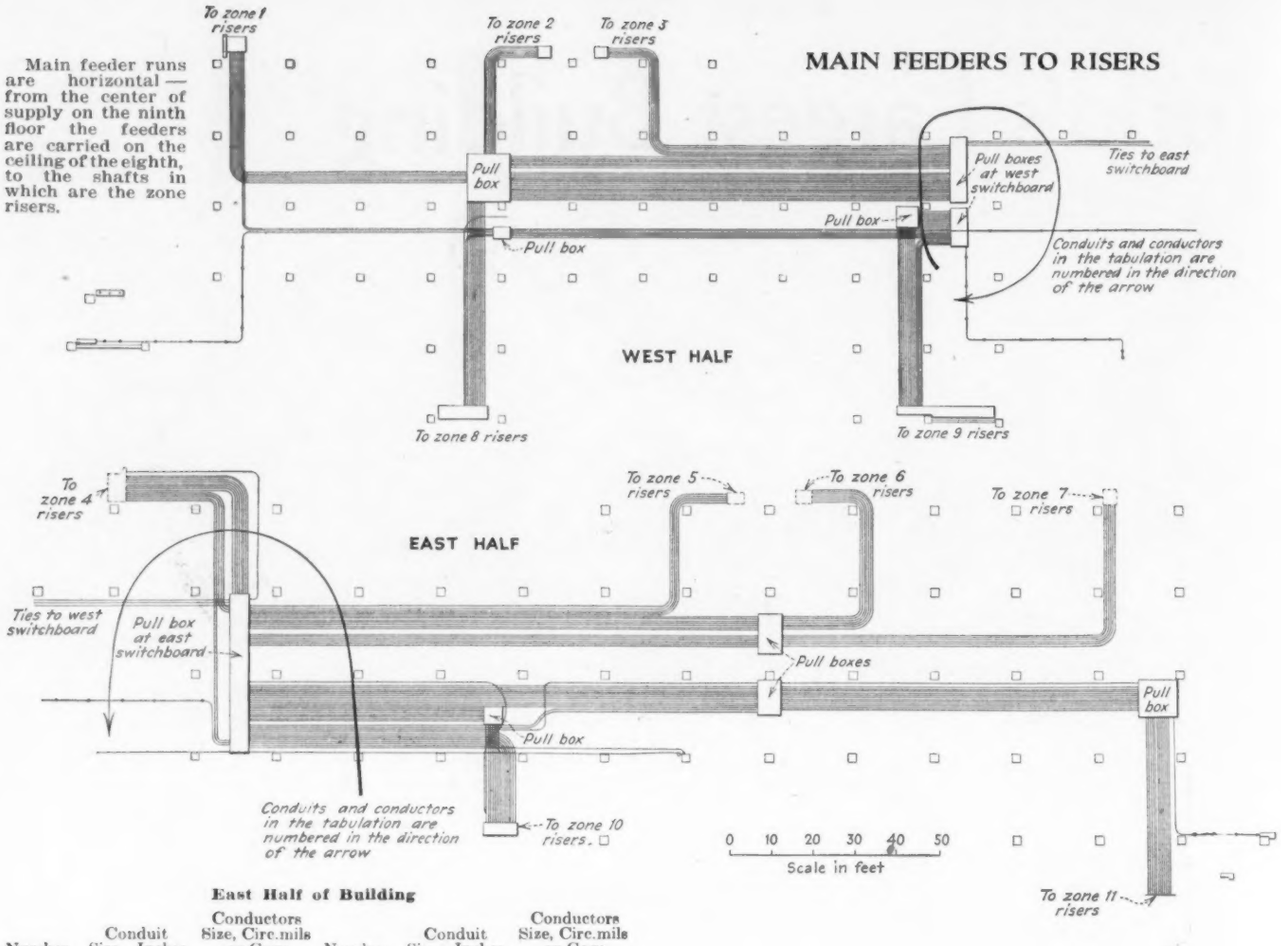
This building, the largest in the world, is owned by the Marshall Field estate. It covers two city blocks and the tower height is 25 stories. It contains 4,000,000 sq.ft. of floor area. Originally contemplated as almost entirely for merchandise warehousing, the building had, by the time of its completion, largely metamorphosed itself into an office structure, so great was the demand for office space. The south front is on the Chicago River.

approximately one-half of the building. The lighting section of each board is divided into four smaller sections, each of these being fed by one 500-kva., single-phase, 115/230-volt transformer. The power section of each board is divided into two smaller sections, each of these being fed by a bank of three 500-kva., single-phase, 440-volt transformers. The main buses of the light and power sections are so arranged that the individual sections may be connected together in the event of failure of any light transformer or any bank of power transformers, thus rendering partial service to all parts of the building. Cable connections have been installed between the east switchboard and the west switchboard further to insure continuity of partial service in the event that the primary service to either of the transformer rooms fails or is disconnected temporarily for maintenance purposes.

Each floor is divided into eleven zones, each having a vertical riser shaft, in which lighting panels are located at each floor. The shafts are so located that by using No. 12 or No. 10 wires for branch lighting circuits the loss of potential on any circuit from the lighting cabinet to the farthest lamp, figuring 1,000 watts circuit load, does not exceed 2 volts. In designing the lighting feeders two important factors were kept in mind, cable capacity and voltage drop, including "skin effect." By previous calculations and experience with other large buildings, it was determined that the most economical size cable to use was 1,000,000 circ.mill and the proper number of lighting cabinets were connected to these so that the voltage drop in any feeder from the switchboard to the lighting cabinet would be as near 3 volts as possible, without exceeding this figure. At the switchboards 230 volts was maintained across the outside legs of each lighting feeder, which means that under full connected load the voltage at the lighting cabinet will be 227 volts or 113½ volts from the outside leg to neutral. Allowing two volts drop in the branch circuit, the minimum volt-

MAIN FEEDERS TO RISERS

Main feeder runs are horizontal — from the center of supply on the ninth floor the feeders are carried on the ceiling of the eighth, to the shafts in which are the zone risers.

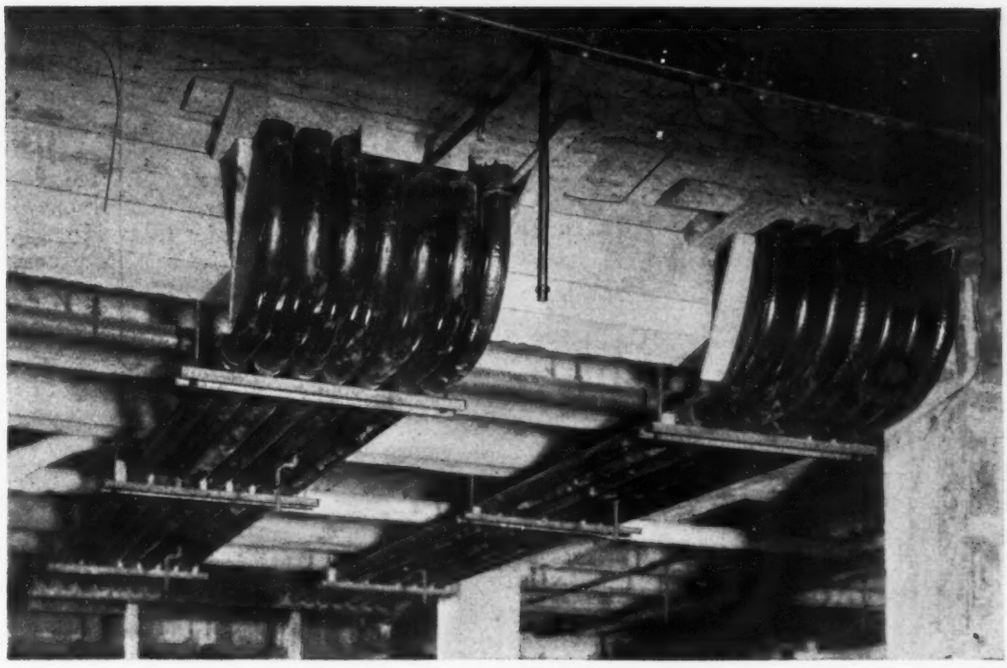

To zone 1 risers
To zone 2 risers
To zone 3 risers
Pull box
Pull box
Pull box
Pull boxes at west switchboard
Ties to east switchboard
Conduits and conductors in the tabulation are numbered in the direction of the arrow
WEST HALF
To zone 8 risers
To zone 9 risers
To zone 4 risers
To zone 5 risers
To zone 6 risers
To zone 7 risers
EAST HALF
Ties to west switchboard
Pull box at east switchboard
Pull boxes
Pull box
Pull box
Conduits and conductors in the tabulation are numbered in the direction of the arrow
To zone 10 risers
0 10 20 30 40 50
Scale in feet
To zone 11 risers

East Half of Building

Number	Conduit Size, Inches	Conductors Size, Circ.mils or Gage
1	1¼	3—No. 1
2	3	3—350,000
3	3	3—350,000
4	3	Empty
5	3	3—300,000
6	4	6—400,000
7	4	6—400,000
8	..	Empty
9	3	3—400,000
10	2½	3—No. 4/0
11	3	Shaft
12	4	Empty
13	3½	2—600,000 1—500,000
14	4	3—1,000,000
15	4	3—800,000
16	3½	2—700,000 1—600,000
17	3½	3—600,000
18	3½	3—700,000
19	3½	3—700,000
20	3½	2—600,000 1—No. 4/0
21	3½	2—700,000 1—600,000
22	3½	2—700,000 1—500,000
23	4	2—1,000,000 1—500,000
24	4	2—900,000 1—400,000
25	3½	2—600,000 1—No. 3/0
26	3	2—400,000 1—No. 1/0
27	4	2—800,000 1—500,000
28	4	2—900,000 1—500,000
29	4	2—1,000,000 1—600,000
30	4	2—900,000 1—400,000
31	4	Empty
32	3	3—250,000
33	4	Empty
34	3½	2—700,000 1—300,000
35	4	2—900,000 1—500,000
36	4	2—800,000 1—500,000
37	4	2—900,000 1—400,000
38	4	2—900,000 1—500,000
39	4	2—1,000,000 1—800,000
40	4	Empty
41	3	2—400,000 1—No. 4/0
42	4	2—1,000,000 1—800,000
43	3½	2—700,000 1—500,000
44	3½	2—700,000 1—500,000
45	4	2—800,000 1—500,000
46	4	2—1,000,000 1—500,000
47	3½	2—600,000 1—300,000
48	4	2—1,000,000 1—400,000
49	4	2—900,000 1—400,000
50	3½	2—700,000 1—300,000
51	4	2—900,000 1—No. 4/0
52	4	2—800,000 1—No. 4/0
53	4	Empty
54	4	Empty
55	2½	No. 4/0
56	4	2—1,000 1—600
57	4	2—1,000 1—600
58	4	3—800
59	4	3—800
60	4	3—800
61	4	3—800
62	3½	3—700
63	3½	3—700
64	4	3—800
65	4	3—800
66	4	3—800
67	3	3—500
68	3	3—300
69	3½	Empty
70	3½	Empty
71	¾	3—No. 12
72	3½	Empty
73	4	3—900

West Half of Building

Number	Conduit Size, Inches	Conductors Size, Circ.mils or Gage
1	3	Empty
2	3	3—300,000
3	3	3—300,000
4	3	3—350,000
5	4	3—900,000
6	2½	3—No. 4/0
7	4	3—800,000
8	3	3—500,000
9	3	3—400,000
10	4	3—900,000
11	3½	3—600,000
12	4	2—1,000,000
13	4	3—800,000
14	3½	3—600,000
15	4	3—1,000,000
16	4	2—800,000 1—400,000 2—700,000
17	3½	1—250,000
18	4	3—800,000
19	4	3—800,000
20	3½	3—700,000
21	3½	1—400,000 2—600,000
22	4	Empty
23	4	Empty
24	4	2—800,000 1—400,000
25	4	2—800,000 1—500,000
26	4	2—1,000,000 1—700,000
27	3½	2—700,000 1—600,000
28	4	2—1,000,000 1—800,000
29	4	2—1,000,000 1—600,000
30	3	2—500,000 1—No. 4/0
31	2½	2—No. 4/6 1—No. 1/0
32	3½	2—600,000 1—No. 4/0
33	4	2—900,000 1—400,000
34	4	2—1,000,000 1—700,000
35	4	2—1,000,000 1—700,000
36	4	2—1,000,000 1—700,000
37	4	2—1,000,000 1—700,000
38	4	2—800,000 1—300,000
39	3½	2—700,000 1—250,000
40	4	Empty
41	4	Empty
42	3	2—500,000 1—200,000
43	3½	2—700,000 1—600,000
44	4	2—1,000,000 1—900,000
45	4	2—800,000 1—500,000
46	4	2—800,000 1—600,000
47	4	2—1,000,000 1—600,000
48	3½	2—700,000 1—400,000
49	4	2—700,000 1—50,000
50	4	2—900,000 1—700,000
51	4	3—1,000,000
52	4	2—900,000 1—800,000
53	4	3—800,000
53	4	3—800,000
55	4	Empty
56	3½	Empty
57	3½	Empty
58	¾	3—No. 12
59	3½	Empty
60	4	3—900
61	2½	3—No. 4/0



Conduit installation

Conduit is not run in concrete floors, but in hangers under them, and is furred over to finish the ceilings.

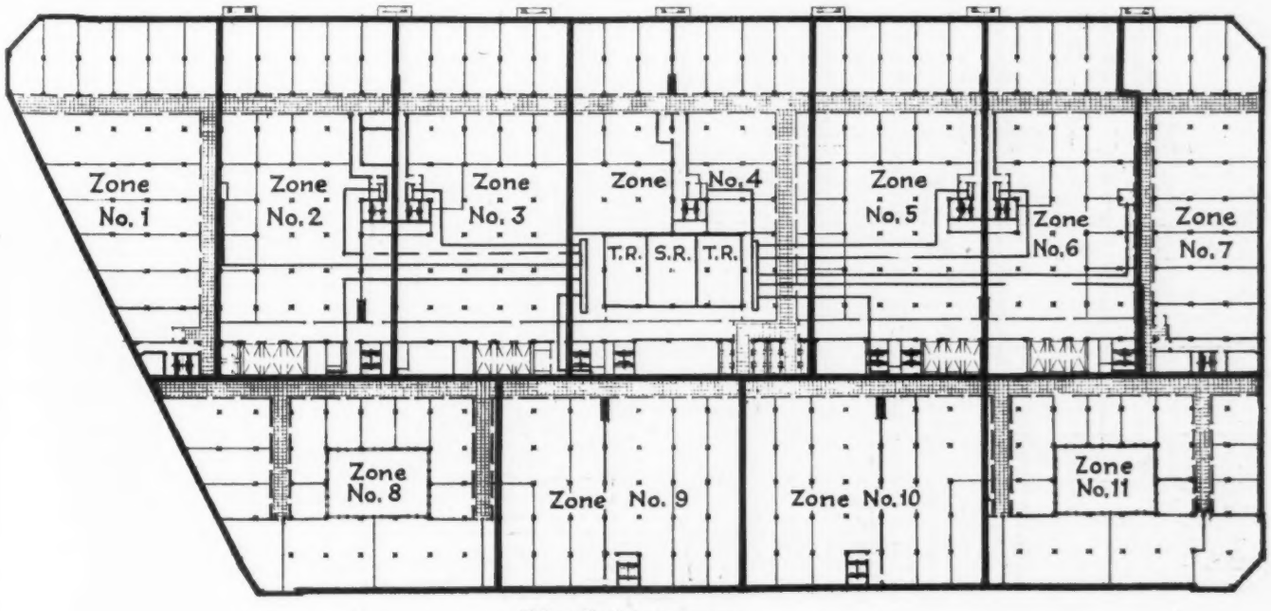
age across any lamp will not be lower than 111½. The lighting feeders are divided into eight groups according to their length, and each group is connected to one section of the secondary switchboard. If at any time the load in any section of the building should exceed an average of 2 watts per square foot the taps on the transformer serving that particular portion of the building can be changed to give the desired voltage at the far end of the branch circuits.

At the time the electrical installation was designed approximately 45 per cent of the 4,000,000 sq.ft. of floor area was to be used for warehouse and manufacturing purposes and 55 per cent was to be rented for office space, the thought being kept in mind, however, that at some future date the entire building would be converted into office space.* In order to provide for this future requirement all feeders were figured on the basis of 2 watts per square foot of floor area and all lighting cabinets were provided with a sufficient number of spare circuits.

The following scheme was devised in order not to provide any more branch wiring than was required for the present needs and still allow for future expansion at minimum expense:

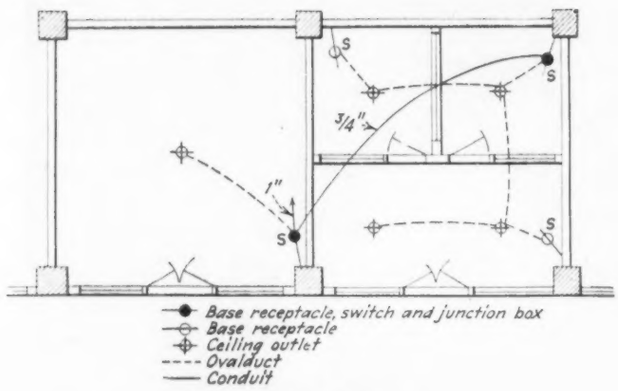
One-inch "home run" conduits were run from the lighting cabinets to a base receptacle outlet on one column in every other bay. This base receptacle outlet was connected with similar outlets on a column in the ad-

**At the time of the opening of the building more than 85 per cent of the space had been rented for office use.*



Distribution zones

This ninth floor plan shows how the building is divided into eleven vertical distribution zones fed from the vertical centers.

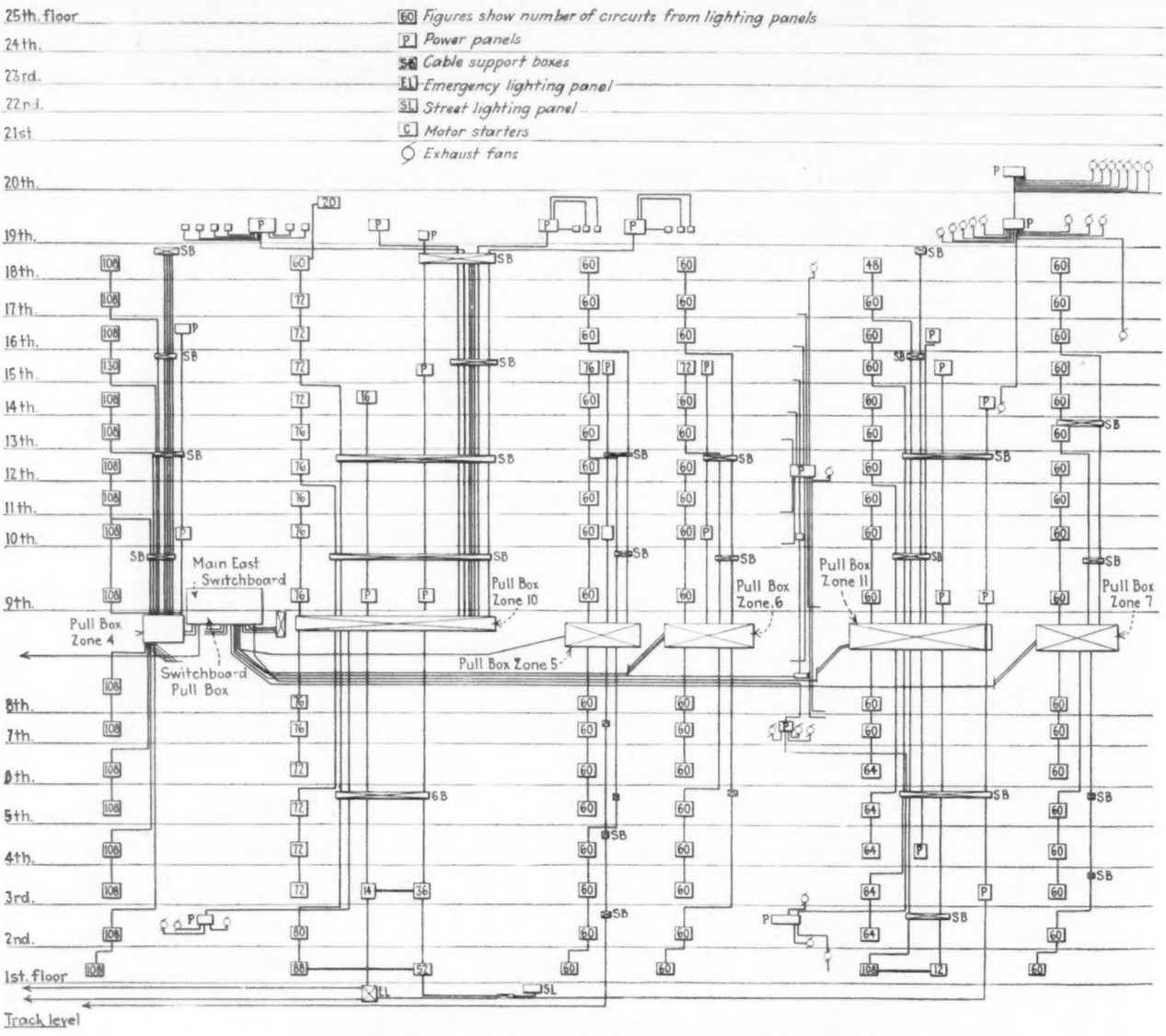


Local distribution

Terminal points at the base of alternate columns supply service to each floor bay. Distribution in bays, according to lighting unit and receptacle locations as fixed by tenants, is in "Ovalduct," which is run in channels and plastered over.

jacent bay by ¾-in. conduit. From each of these base receptacle outlets ¾-in. conduit was extended up the column to a two-gang switch box located 4 ft. 6 in. from the floor and thence up to a similar outlet box near the ceiling. While the latter outlet is not on the ceiling, it is referred to as a "ceiling junction box." The two-gang switch outlet box is provided with a two-gang cover and plate, the latter fitted for one or two switches, as required. In order to avoid changing the plastering and plate at some future date to install two switches where one is originally required, a two-gang ring has been installed with a bakelite plate having one slot for the present switch and a knockout for the second one, which may be punched out at the time the second switch is to be installed.

The top of the ceiling junction box is provided with two ½-in. knockouts, in one of which is fastened a 90-deg. vertical "Ovalduct" elbow, from which "Ovalduct" is carried in the plaster to a ceiling outlet in the



Vertical distribution from pull box zones in east half

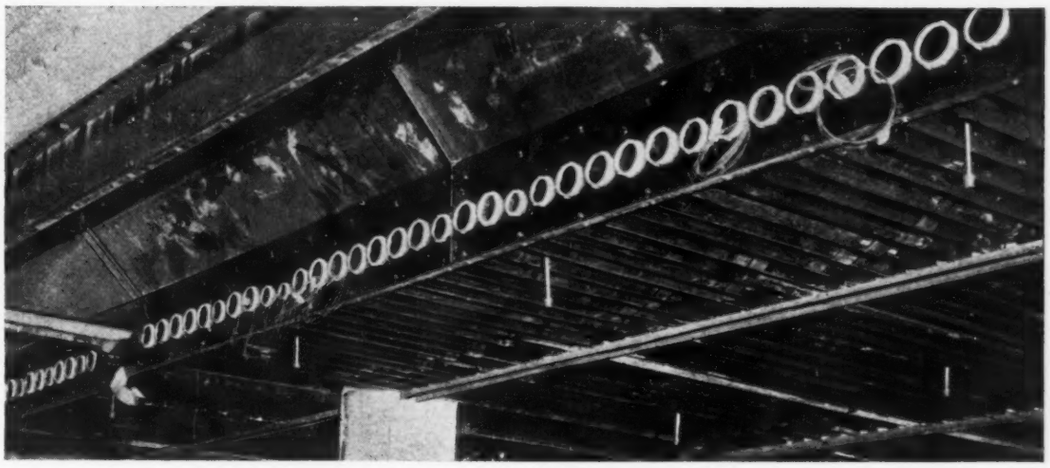
This drawing, in conjunction with that on page 476, showing feeder runs from the transformer banks, explains the scheme of distribution. Feeders run vertically from the zone pull boxes to the circuit panels, each one of which supplies from 60 to 108 lighting circuits. The panels include arrangements so that service to each tenant is metered.

center of each bay. When the space is converted for office purposes the center outlet can be removed and the proper number of outlets installed that may be required to meet the arrangement of partitions. This scheme of wiring permits removal of any unused outlets, which is not possible if the wiring is run in round conduits cast in the building slab.

In order to provide the most reliable service possible for the fire pumps and for exit, stairway and "night" lights, a second source of supply was brought into the building directly from the Commonwealth Edison Company's direct-current mains in the street. This service is brought into the boiler rooms beneath the tracks, at which point a direct-current switchboard is located. Cables for the exit, stairway and "night" lights are run to seven of the eleven vertical riser shafts in the building, where panels for this service are located on the third, ninth and fifteenth floors of each of the above shafts. These cables are connected through fuses to an electrically operated, remotely controlled switch on the direct-current switchboard, which in turn is controlled by a momentary contact switch located in the main entrance of the building.

Among the many tenants of the building, one of the largest is the National Broadcasting Company, whose studios are located in an especially constructed penthouse on the roof. The design of light and power service for this portion of the building required considerably more study than for the tenant who uses his space for the transaction of ordinary business. Great care had to be exercised in running conduits and locating outlet boxes for ceiling lights and base receptacles and in the designing of lighting fixtures so as not to detract from the acoustical and sound-deadening features of the studios and control booths.

The entire area for the National Broadcasting Company is wired with both direct and alternating current, the direct current being supplied from three 250-kw. motor-generator sets located adjacent to the studios on the twentieth floor. The greater part of the direct current will be used to light arc lamps for television work, as soon as television has been developed beyond the experimental stage. The reason for using direct-current arc lamps is that the image which results from a pick-up illuminated by alternating current is distorted by the 60-cycle frequency and its various harmonics. The largest studio of the group has two entirely independent lighting installations, one using the standard gas-filled lamps and the other using sunlight lamps. The latter installation consists of 36 sunlight units mounted flush in the soffits of the drop beams and so designed and arranged as not to detract from the architectural beauty of the studio or to give the effect of too many lighting fixtures. The sunlight installations, in addition to giving off health rays, may be used to illuminate the studios for ordinary purposes.



Spacious pull boxes are used

Large conductors and complete isolation of feeder circuits in separate conduits require pul boxes not ordinarily carried in contractors' stocks.

Table of Power Applications in the Merchandise Mart

Purpose	Horsepower	Purpose	Horsepower
Fans	1,647	Refrigeration	420
Elevators	2,605	Pneumatic tubes	300
Pumps	508	Miscellaneous	280
Motor-generators	750		
Manufacturing	400	Total	6,910

▼ ▼ ▼

Where 0.3 Cent Grows to $30,000,000

ACCUSTOMED as we are in these day to high rates of amplification, a factor of 10,000,000,000 still looks rather staggering. But that is what happens to the customer's savings when a reduction occurs in the average price per kilowatt-hour for the country as a whole.

For the twelve months ended June, 1930, the average residential rate was 6.05 cents; for the corresponding period ending in the middle of 1929 it was 6.34 cents. The reduction approaches 5 per cent. Our annual expenditure for electrical energy for residential purposes is somewhat in excess of $600,000,000. A cut of 5 per cent, therefore, rises to the respectable total of $30,000,-

000—and all this on an item of household expense which, to begin with, averages less per day than the cut-rate price of a package of cigarettes and about the same as a pint of milk to the metropolitan consumer.

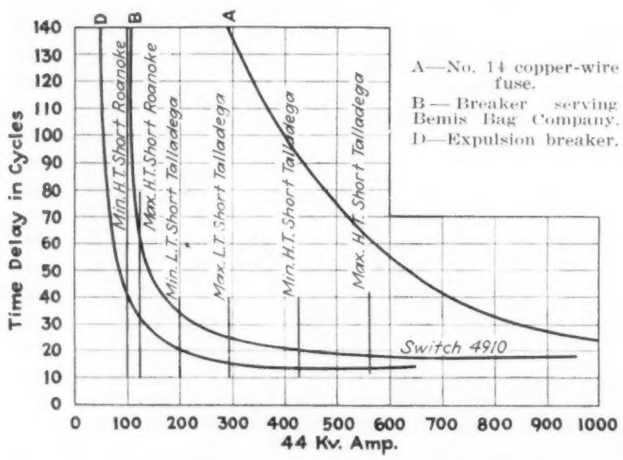
▼ ▼ ▼

Expulsion Breaker Solves Customer Service Problem

By S. J. SPURGEON
Alabama Power Company

THE expulsion circuit breaker now being used on the system of the Alabama Power Company has been developed to replace expulsion fuses where it is impossible with the use of fuses to obtain selective operation between fuses and other protective devices on the system. In addition to being able to obtain selective action with the use of this equipment, there are other features of merit obtained through its use. In order to show the merits of this equipment over fuses which are ordinarily used, a typical installation will be explained.

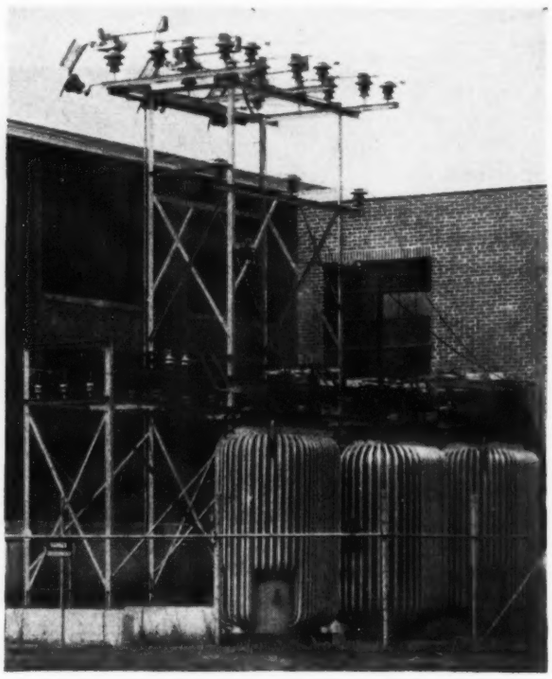
For example, in applying fuse protection to the Bemis Bag Company substation at Talladega, Ala., where three 1,500-kva. transformers are installed, it would be necessary to use No. 14 copper fuse wire, since this is the smallest conductor which can be applied to a load of this size. No. 14 copper, however, would give no protection, as indicated by the accompanying curves. If copper wire were used as a fuse element, then the breaker at Jackson Shoals would open for any trouble in the transformers at the Bemis Bag Company and all load being fed from this line would be interrupted until the



Current-time characteristics that influenced use of expulsion breaker for typical case

trouble could be found and disconnected. The breaker at Jackson Shoals cannot be raised in setting so as to have greater current-time characteristics than the No. 14 copper, since it must not be set beyond the minimum short circuit which can be obtained at Roanoke, which is at the end of the line. This value is 100 amp. at 44,000 volts. It will also be observed that under maximum short-circuit conditions at Talladega the breaker at Jackson Shoals will open in 19 cycles of time, while copper wire will fuse in 60 cycles of time on a 60-cycle system.

Therefore No. 14 copper wire cannot be used for protection at the Bemis Bag Company substation. A smaller fuse wire cannot be used, since one small enough to operate before the breaker would not carry the normal load of the mill. It also will be noted that a No. 14 copper wire carrying 60 amp. of current, which is approximately full-load current on the bank, carries a temperature of about 300 deg. C. This temperature is sufficient to carbonize the fuse tube. If after a fuse tube is carbonized the element ruptures, an arc follows through the tube and the fuse itself arcs over, possibly causing an interruption to all customers along the line.



Expulsion circuit breakers on industrial service

The expulsion circuit breaker is so designed that the current-time characterics are not determined by the thermal characteristics of a metallic wire, but by an adjustable relay, which when it operates releases a mechanism and breaks a metallic element in the center of the expulsion tube. This causes an arc inside the tube and the arc is broken, just as in an ordinary expulsion fuse. The metallic element inside the expulsion tube is large enough so that ordinary load currents do not produce a temperature in the element high enough to injure the tube. This type of protection, therefore, allows cheap protection for high-voltage substations and allows current-time characterisitcs to be obtained which can be co-ordinated with other protective mechanisms on the system. It also eliminates the danger of destructive temperatures inside the expulsion tube such as are encountered in the ordinary fuse.

Reducing Gate Leakage* Saves $36,000 a Year

By E. B. STROWGER

Assistant Hydraulic Engineer
Niagara Falls Power Company

IN THE operation and maintenance of hydro-electric plants large savings have sometimes resulted from a consideration of items which appear to be of rather small moment. Among these items may be mentioned the loss of possible kilowatt-hours through the wasting of water through turbine gate clearance spaces. Although this clearance may be small when machines are new, it may develop by wear so that considerable water is allowed to pass when the gates are supposedly tight. In operating hydro units as synchronous condensers during light-load periods with the turbine gates ostensibly tight shut considerable water may be lost, and in the case of a storage development the equivalent kilowatt-hours lost may represent a large sum of money, because with such a development these kilowatt-hours may be applied to the peak of the daily load curve, or, what is still more important, may be saved for use in meeting the seasonal peak loads.

The results of nearly 100 leakage tests made on turbines of various size and make located within the United States and Canada are given in Table I. It is interesting to note that the average gate leakage of 40 *new* units is 1.1 per cent of the rated discharge of the turbine, while the corresponding value for 37 *old* units is 6.1 per cent. These figures apply to units with wicket gates and do not include the units listed in the table as having cylinder gates, since this type of gate is usually of special application.

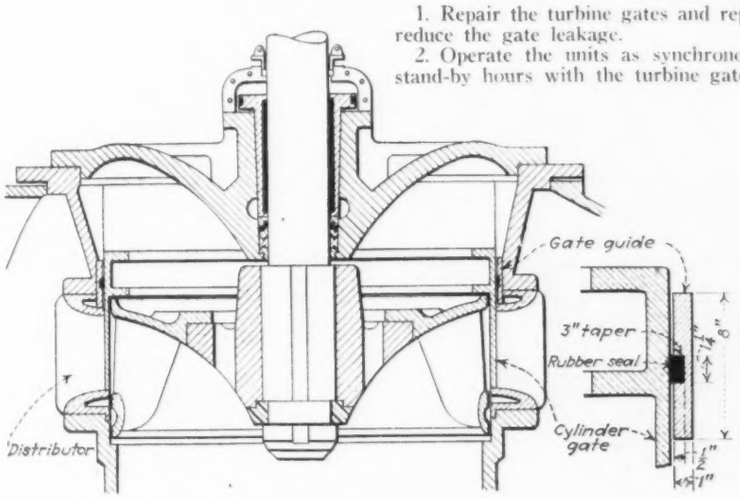
As an illustration of the value of minimizing the leakage by making repairs to turbine parts such as wearing rings, guide vanes, etc., two cases will be cited:

The wheels of a hydro plant had been in service for a period of years with no alterations or repairs of any kind. An inspection revealed that the wearing rings were well worn, that they needed replacement and that the wheels and guide vanes needed welding and repair. A thorough testing program carried out at the plant showed that the average turbine gate leakage was about 30 cu.ft. per second, or about 8 per cent of the rated discharge of each unit. The plant is one involving considerable storage, so that water was stored at night to be used during the peak hours of the day.

At night between midnight and 7 a.m. the machines were normally operated as synchronous condensers at the speed-no-load point, using 50 cu.ft. of water per second through each machine instead of taking motoring power from the line, at this point of operation the turbine gate opening being about 10 per cent of full opening. The importance of stopping the use of water at the speed-no-load point is apparent when it is realized that between the hours of about 12 midnight and 6 or 7 a.m. the plant in acting as a stand-by at the speed-no-load point used approximately 200 cu.ft. per second, which is 35 per cent of the average river flow. Even operating with the wickets tight shut meant a use of 120 cu.ft. per second, or about 20 per cent of the average stream flow.

On the basis of the tests which were carried out it was decided to do the following in order to realize the most favorable operation of the plant:

1. Repair the turbine gates and replace the wearing rings to reduce the gate leakage.
2. Operate the units as synchronous condensers during the stand-by hours with the turbine gates closed instead of being



Rubber seals on cylinder gate guide virtually eliminated leakage

**McGraw third prize paper.*

fixed at the speed-no-load position. This would have the effect of reducing the consumption of water from approximately 50 cu.ft. of water per second per unit to about 15 cu.ft. per second per unit when operated as condensers.

3. To distribute the station load among the units operated in the most efficient manner as indicated by the test curves.

The turbine repairs have been intermittently in progress since October, 1929, and at this writing two of the four units have been finished. Leakage tests have been made on the two wheels subsequent to their repair and show that the gate leakage is now approximately 15 cu.ft. per second per unit. Revised methods of operating as per paragraphs (2) and (3) above are in force, resulting in substantial gains. To indicate what the gain will amount to when all four units are finished, a study was made of the actual operation for the months of July and August, 1928, comparing the actual production with the production which would obtain under the new conditions. Tables II and III show the results. The total volume of water that would have been used and the number of kilowatt-hours that would have been produced during these months if the turbine gate leakage could have been reduced to zero and the assumed method of operation followed are indicated in Table III.

It would, of course, be difficult to reduce gate leakage to zero and attain the production per cubic foot indicated in Table III, but these values were calculated for use in Table IV for determining the net gain in station economy after allowing for the quantity of water wasted in stand-by leakage during the months in question, viz., 138,620,000 cu.ft. and 142,508,000 cu.ft. respectively.

When operating the units as synchronous condensers with the turbine gates closed, it would be necessary to

Table I—Turbine Gate Leakage of Various Hydro Units

Rated Hp.	Design Head	Speed	Approx. Cu.Ft. per Second per Rated Hp.	Leakage, Cu.Ft. per Second	Leakage, Per Cent of Rated	Remarks
37,500	2,135	150	1,680	10.7	0.64	New
37,500	2,135	150	1,710	13.4	0.78	New
37,500	2,135	150	1,710	14.8	0.87	New
3,400	115	300	300	4.5	1.50	New
5,500	140	250	430	3.5	0.81	Cylinder gate
10,000	210	300	476	20.0	4.20	Double runner. Outside mechanism.
10,000	210	300	480	24.5	5.11	
10,000	210	300	489	23	4.71	
10,000	210	300	486	16.6	3.42	Double runner. Inside mechanism.
10,000	210	300	480	36	7.50	
10,000	210	300	477	27.6	5.78	
10,000	210	300	488	26.8	5.49	
10,000	210	300	487	35	7.19	
10,000	250	360	480	115	24.0	Before alterations to unit.
10,000	250	360	400	30	7.50	After alterations to unit.
10,000	250	360	470	44	9.36	.....
12,000	105	150	1,090	25	2.29	.....
5,500	140	250	428	3	0.70	Cylinder gate.
5,500	140	250	454	3.7	0.82	Cylinder gate.
5,500	140	250	450	11	2.44	Cylinder gate.
5,500	140	250	450	7.4	1.65	Cylinder gate.
9,000	265	341	348	31.3	9.00	New
9,000	265	341	350	31.8	9.09	New.
9,000	265	341	344	34.1	9.92	New.
1,700	265	360	89	40	44.9	.....
9,000	265	341	400	31.1	7.77	New.
55,000	305	187.5	1,750	25	1.43	New.
10,000	....	250	920	128	13.9	Cylinder gate. Two turbines on one shaft.
10,000	....	250	900	36.5	4.05	
12,500	....	250	1,130	11.8	1.05	
12,500	....	250	1,020	8.5	0.83	
70,000	213.5	107	3,100	16	0.52	New.
3,400	115	300	300	20	6.67	.....
12,000	127	250	950	10	1.05	New.
11,000	75	1,333	1,480	14	.95	New.
70,000	213.5	107	3,130	50	1.63	New.
70,000	213.5	107	3,080	69	2.24	New.
12,000	400	514	295	3.4	1.15	New.
30,000	95	100	3,060	10	0.33	New.
30,000	95	100	3,040	9	0.30	New.
35,000	90	100	3,690	10	0.27	New.
18,000	81.5	133.3	2,330	5	0.21	New.
18,000	81.5	133.3	2,200	5	0.23	New.
18,000	81.5	133.3	2,130	6	0.28	New.
28,500	330	300	780	10	1.28	Leakage quantity obtained by Gibson diag. New.
28,500	330	300	775	12	1.55	
3,600	200	450	210	7	3.33	Clearance top and bottom of guide vanes 0.020 in., six gates open 0.016, six open 0.012 in., four open 0.006 in.
3,600	200	450	230	4.5	1.96	Clearance top and bottom of guide vanes 0.016 in.
8,500	200	360	407	6	1.47	New clearance, top 0.015 in., bottom 0.015 in.
9,350	200	360	458	6	1.31	
45,000	145	120	3,040	16	0.53	New.
45,000	145	120	3,080	24	0.78	New.
830	50	375	....	9	6.0	.....
800	50	375	....	20	13.3	.....
830	50	375	....	6	4.00	.....
12,000	75	133⅓	1,625	9	0.55	New.
31,100	70	90	4 850	12	0.25	New.
25,600	70	75	3,950	14	0.35	New.
31,100	70	90	4,850	10	0.21	New.
10,000	245	375	374	30	8.02	.....
10,000	245	375	370	30	8.06	.....
10,000	245	375	372	29	7.79	.....
10,000	245	375	373	29	7.77	.....
54,000	89	81.8	6,400	10	0.16	New.
54,000	89	81.8	6,150	18	0.29	New.
1,900	89	360	206	1.1	0.53	New.
34,000	132	125	2,690	10	0.37	Clearance, top 0.016 in., bottom 0.028 in. New.
34,000	93	100	3,760	17	0.45	New.
10,000	96	185	1,000	19	1.90	Old setting. New runner
10,000	92	180	1,000	21	2.10	
5,350	47	164	1,300	62	4.77	.....
5,350	47	164	1,300	66	5.08	.....
6,000	45	164	1,500	40	2.67	.....
6,000	45	164	1,500	61	4.07	.....
6,000	45	164	1,560	68	4.36	.....
34,000	132	125	2,700	15	0.56	Clearance, top 0.015 in., bottom 0.047 in. New.
34,000	132	125	2,700	17	0.63	Clearance, top 0.023 in., bottom 0.048 in. New.
34,000	132	125	2,700	10	0.37	Clearance, top 0.014 in., bottom 0.024 in. New.
9,000	80	163.6	1,075	15	1.40	Clearance, top 3/64, bottom 3/64 in.
9,400	90	187.5	1,088	12	1.10	Clearance, top 0.010 in., bottom 0.047 in. New.
9,400	'0	187.5	1,065	5.5	0.52	Clearance, top 0.017 in., bottom 0.041 in. New.
9,400	90	187.5	1,065	6	0.56	Clearance, top 0.028 in., bottom 0.024 in. New.

Tables II and III—Water Used per Kw.-Hr. Before Repairs and What It Might Have Been Under Ideal Conditions

Before repairs—Leakage per unit = 30 c.f.s.

	Kw.-Hr.	Total Volume of Water, Cu.Ft.	Volume of Water per Kw.-Hr.
July, 1928	1,954,200	840,920,000	430
August, 1928	2,140,000	887,643,000	414
Average			422

Ideal Operation—Leakage per unit = 0 c.f.s.

	Kw.-Hr.*	Total Volume of Water, Cu.Ft.	Volume of Water per Kw.-Hr.
July, 1928	1,670,000	330,295,000	198
August, 1928	1,847,000	358,719,000	194
Average			196

*The reduction of about 300,000 kw.-hr. compared with Table II is the result of omitting energy actually generated when unit was supposed to be operating as a synchronous condenser.

supply energy from the system. The power consumed in this manner has been determined to be 220 kw. per unit, and the total input of energy during July and August would have been 564,700 kw.-hr. and 580,600 kw.-hr. respectively.

Using the same relation between quantity of water and kilowatt-hours as shown in Table III, the output from the total quantity of water actually used during the months of July and August, 1928, would be as shown in Table IV. Although the gain in energy production shown would probably not be a big percentage of the total output of a large system, yet when considered as a percentage of the individual plant output its relative size is apparent. The plant in question has produced on an average about 5,500,000 kw.-hr. per month, so that the gain shown, viz., about 1,000,000 kw.-hr. per month, represents 18 per cent of this energy output.

It should be noted that the value of the energy for synchronous condenser operation, being off-peak, is probably less than the value of energy produced in the plant itself on peak, but in calculating the net gain, as shown in Table IV, no differential in price has been applied. At 4.4 mills per kilowatt-hour the net gain would be about $4,700 per month. Of this amount about $3,000 is due directly to the reduction in turbine gate leakage. During the time when water is spilled over the dam there would, of course, be no such gain. Table V shows the per cent of time each year when no water was being spilled over the dam for the years 1926, 1927 and nine months of 1928.

Table IV—Net Results Obtainable if Leakage Had Been Avoided

Leakage = 15 c.f.s.

	July, 1928	August, 1928
Total quantity of water available, cu.ft	840,920,000	887,643,000
Water to be wasted through gate leakage, cu.ft.	138,620,000	142,508,000
Remaining water to be used, cu.ft	702,300,000	745,135,000
Water per kilowatt-hour, cu.ft	198	194
Kilowatt-hours to be produced	3,545,000	3,840,000
Kilowatt-hours actually produced	1,954,000	2,140,000
Kilowatt-hours gained by proposed operation	1,591,000	1,700,000
Less kilowatt-hours used from line to operate units as synchronous condensers	564,700	580,600
Net gain in kilowatt-hours	1,026,300	1,119,400
Value of gain, at 4.4 mills per kilowatt-hour	$4,520	$4,930

It is seen from the above that it is possible to increase the salable output of the plant sufficiently to produce a substantial increase in revenue.

Another case involving the minimizing of the leakage through turbine gates in which the water has been associated was concerned with a stand-by hydro-electric plant having cylinder gates. While the saving involved was of a smaller order than the one just discussed, it was well justified in view of the fact that the rôle of the plant in acting as a stand-by for long periods of time necessitated the most economic operation. In the event of an interruption at one of the other stations the units at this particular station were to be immediately available, and yet while not in use there should be a minimum use of water due to leakage because such water is considered as part of the company's allowable diversion. In operating the plant as a stand-by, operating pressure is

Table V—Per Cent of Total Time When Water Was Spilling Over Dam

Years 1926-1928 Inclusive

Year	Per Cent of Total Time Spilling	Not Spilling
1926	25.1	74.9
1927	15.7	84.3
1928 (nine months)	14.2	85.8

maintained in the wheel cases of five or six units. The cylinder gates on the turbines seated tight on the bottom seat, but there was a small amount of leakage past the upper gate seal into the space below the headcover and thence to the draft tube. This leakage quantity varied from about 5 to 7 cu.ft. of water per second.

To stop this leakage entirely several units have been fitted with rubber seals on the cylinder gate guide. A strip of rubber, as shown in the accompanying illustration, was set in the gate guide. This pressed against the gate, leaving the latter free to move, yet fitting so close that all leakage to the headcover was practically stopped irrespective of the position assumed by the gate. With the valve closed and with full operating pressure in the wheelcase, an inspection below the runner showed no noticeable leakage.

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Electric Rivet Cutting Brings Railroad Economies

ELECTRIC cutting of rivet heads for railroad car repairs has superseded acetylene cutting in the Chesapeake & Ohio car shops at Raceland, Ky. Operating figures, according to E. W. MacCorkle, Jr., power engineer Kentucky & West Virginia Power Company, Ashland, Ky., show that the electric process cuts rivets much faster than acetylene and at about half the cost.

This 2,000-kw. installation is said to be the first large all-electric rivet cutting and heating plant in the world. The cutting equipment includes one induction-motor-driven d.c. generator and two synchronous motor-generator sets. This enables the simultaneous use of twenty cutters, each drawing 300 amp. The positive

terminal of the 80-volt supply from the generators is bonded to the repair tracks, so that the crater developed by the d.c. arc is in the rivet shank to facilitate removal. A workman starts along a row of steel car rivets, striking an arc from a carbon electrode for about ten or fifteen seconds on each rivet. After he has passed the rivet head is no more, and the original reamed hole in the side plate has not been damaged.

Electricity not only removes the old rivets but, when they are to be replaced, heats all new rivets for driving. There are, at Raceland, 47 electric rivet heaters, ranging from 55-kw. five-electrode to 22 kw. two-electrode heaters. These are of the single-phase transformer type. The rivet to be heated is clamped between copper electrodes forming the ends of a single-turn transformer secondary operating from a 440-volt supply. The rivet heats white hot in twenty seconds.

This method of heating has proved very economical, as there is no heat and little power consumption when no rivets are in the heater and little radiation loss while heating. The manufacturer, the American Car & Foundry Company, claims that rivets can be heated by this method with an average energy consumption of $18\frac{3}{4}$ kw.-hr. per 100 lb. of rivets. In addition to being more economical, electric rivet heating is much more convenient and cleaner than the old type of oil forge.

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Customer Stockholders— A Receptive Appliance Market

By E. PAUL YOUNG
President E. Paul Young & Company, Inc., New York

Comment by leading utility executives on Mr. Young's article which appeared in the June 14 issue of the "Electrical World" resulted in the present discussion of the huge potential market for load-building appliances which customer stockholders constitute

CUSTOMER stockholders in a utility company provide a definite market for the distribution of gas and electric appliances sold by the company.

Following an intensive selling campaign, in which the entire customer list had been circularized, the new-business manager of a large company checked up the number of refrigerators sold by his company to, or through, customer stockholders. It was found that approximately 42 per cent of the buyers were stockholders.

This company, at the time the new-business manager made his refrigerator sales report to the operating vice-president and the other executives, had been conducting customer-ownership stock campaigns over a period of ten years. More than 16 per cent of the company's customers were stockholders.

The customer stockholder is a logical prospect for appliance sales. In the first place, the person who buys stock in a company is the intelligent type of buyer who knows the labor and money saving advantages of appliances offered by utilities; in the second place, there is the incentive of letting the dividends pay a large part or all of the electric bill; thirdly, there is the desire of the customer stockholder to contribute to the success of his company by purchasing its wares.

Obviously, all utilities are interested in increasing sales of electric and gas appliances. More electric irons and ironers, washing machines, electric and gas heaters, refrigerators, vacuum cleaners, etc., sold mean more current and gas consumed, which in turn, means increased revenue per customer.

How can a company use its customer stockholders to increase its sale of appliances?

A customer stockholder always will give more time to the understanding of a sales message, because of his financial interest in what his company is doing to promote new business.

Every sales promotion manager is fearful of getting too much detail into his sales story, but this does not worry him when he is dealing with stockholders. He knows that they will follow closely a definite line of reasoning; he is selling appliances to partners in business.

For example, gas heating. Every gas company emphasizes the benefits of heating with gas. Experience has shown that customer stockholders are the easiest to approach with this particular sales message.

Urge neighbors to buy appliances

It has been proved, too, that customer stockholders will go out of their way to encourage their neighbors and friends to purchase appliances handled by their company. Pride in the quality of the products sold by the company in which one is a partner, coupled with the natural desire to see the company's business grow, is the answer.

The new-business manager of one prominent company stimulated the sale of a new type of electric iron by giving one free to every woman stockholder who persuaded five of her friends to buy an iron at the regular price. The result was astonishing.

Another company was pushing the sale of its radio-receiving sets. The revenue here is derived not so much from the small amount of current used by the radio as the increased amount of electric light used. The best radio programs are on the air in electric light time and a radio has a very definite effect on the light bill each month.

This company made a survey of 100 customer stock-

holders who owned radios. It was discovered that 85 per cent of these stockholders were ardent boosters for their company's radio product. Moreover, they insisted that not only was this type of radio the best on the market but that the most satisfactory way to purchase it was direct from the company.

Another point to be remembered is that the stockholder purchaser of appliances on the installment plan has an immediate financial standing with the company. A check-up of several companies on repossessions shows almost a negligible amount from customer-stockholder purchasers.

Many electric and gas companies require new customers to make a deposit before the service is connected This is unnecessary if the prospective customer is a stockholder; his credit rating already is established, and if he becomes a stockholder after he has made his deposits, the deposits may be returned. All element of risk is removed when he is on the stockholders' list.

There is good public relations material in this deposit angle. Incidentally, an alert new-business manager will find some way of returning deposits in the form of appliances. In the departments of wholesaling and sales engineering the customer stockholder is a powerful ally in adding "big business." He has definite value in this respect.

Helps industrially as well

One large electric and gas company had tried unsuccessfully for two years to add to its list of customers a large manufacturing plant using gas and electricity for heating and motive power.

An employee of this utility company sold the financial head of the industrial prospect 100 shares of preferred stock. One month after this sale was made the way was open for the utility company's sales engineer to survey the requirements of the prospective customer.

The contract was signed. In signing, the industrial executive said that until he had invested in the 100 shares he had never known how the utility company had operated.

Hundreds of similar examples might be cited, even some instances wherein businesses have invested their surplus funds in utilities stock and the dividends have almost paid for the gas and electric service charges. Such companies use their utilities shares to stabilize their financial status.

Furthermore, these holdings are used by companies as collateral to tide them over lean months and taken up when business conditions improve. In these days of intensive selling, more merchandising companies than ever before are using their stockholders' list to sales advantage. A recent example is the Chrysler Corporation. In a letter sent to 40,000 stockholders of this corporation with their dividend checks for the second quarter of the year Walter P. Chrysler, president, urged stockholders to buy the company's cars.

The Chrysler letter, in part, follows:

"The stockholders have it in their hands to further in a very substantial way not only the corporation's progress but also their own financial interests as owners of its securities. I mean, of course, by buying Chrysler-built cars themselves, and as the opportunity is presented by suggesting to their friends that, regardless of price, Chrysler motor products meet every one's car needs."

What can be more definite as a sales appeal? Here stockholders are given an opportunity to help their company and themselves by buying their company's products and by inducing their friends to do likewise. Every customer a stockholder; every stockholder a customer, and every customer stockholder a salesman!

Customer ownership, as an approved method of junior financing, has many advantages, not the least of which is its power to increase retail sales of appliances and wholesale distribution of service.

There is no reason why a utility corporation should not have at least 15 per cent of its customer list represented on its stockholders' list. All that is required is a properly handled customer-ownership campaign. This done, the company has provided for its wares a potential market of infinite and far-reaching value—a market in which the minimum sales effort brings maximum returns.

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Useful Building Record Card

By CARL W. EVANS
San Antonio Public Service Company, San Antonio, Tex.

DURING the construction of large buildings it is necessary for the planning department of the local power and light utility to refer frequently to estimated load data, service cables required and other relevant information. In the accompanying illustration is shown a record card which has proved most beneficial to the writer.

In general, as decisions are concluded regarding service size, type of rate, type of service, connected load,

ELECT. U. G. 633 1-29-100

UNDERGROUND DEPARTMENT
BUILDING RECORD CARD

Name .....
Location ..... Vault No. .....
Date Installation Started ..... Date Finished .....
Type of Service: 1 ø Lt. ..... 1 ø Pr. ..... 3 ø Pr. ..... N W S .....
Size of Service: 1 ø ..... 3 ø ..... N W S .....
Type of Rate .....
Metered as Follows: .....

LOAD DATA

Total Connected Load: 1 ø Lt. ..... 1 ø Pr. .....
3 ø Pr. ..... X-Ray .....

MAXIMUM DEMAND DATA

DATE	1 ø MAX. DEM.	PF	3 ø MAX. DEM.	PF	NWS. MAX. DEM.	PF	DATE	1 ø MAX. DEM.	PF	3 ø MAX. DEM.	PF	NWS. MAX. DEM.	PF

Record card is useful in distribution planning

etc., the items are posted on the card and are easily available for reference when, several months later, as it is in most cases, the actual order for installation must be issued.

During the year following completion the maximum demands are recorded on the card for each month and the card attains a further value as a record of the ratio of maximum demand to connected load for that specific type and size of building.

Hot-Line Tools Cut Reinsulating Cost

By G. F. PHYTHIAN

General Superintendent of Construction
Byllesby Engineering & Management Corporation,
Chicago, Ill.

WHEN it was decided to raise the voltage of the 123-mile line from the Prospect plant of the California Oregon Power Company to Springfield, Ore., from 66 kv. to 110 kv. two methods were available. It could be done by killing the line and adding the necessary three units per string or it could be done with the line hot. Both methods were considered and thoroughly analyzed before making a final decision as to what method should be adopted.

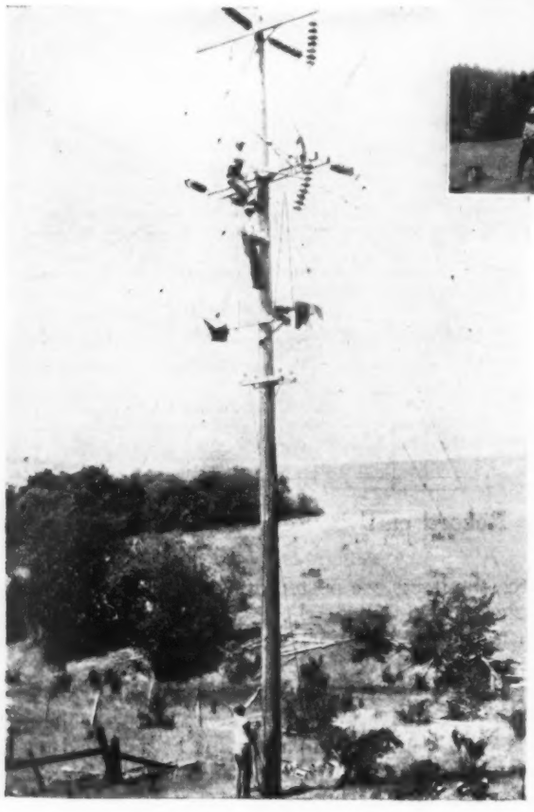
To kill the line for reconstruction would have resulted in an interruption in service as well as serious inconvenience in operation, and also it would have made a difficult and expensive construction job, due to the fact that the work could not be carried on continuously without delay and loss of time. For these reasons the final decision was to undertake the job by the live-line tool method. The estimate for the work was prepared on the basis of having to kill the line while the insulators were being changed. Actual costs by the hot-stick method show a substantial saving over the estimated cost, which proves the wisdom of the decision to work the line hot.

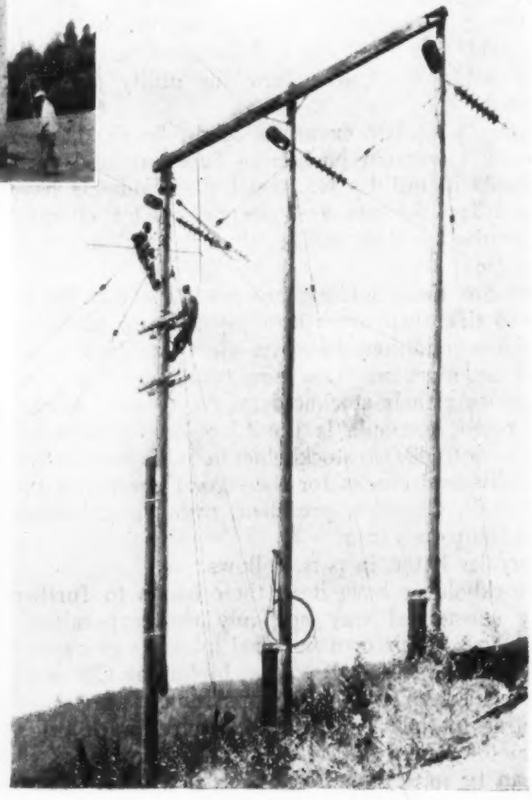
The work was done by a small crew of hand-picked men who were paid somewhat above the usual scale of wages and the job was carried through to completion without a single accident which resulted in injury to the workmen. The work was begun June 8, 1929, and completed September 16, or about 96 working days. The crew consisted of four linemen, four groundmen, one foreman, truck and driver and three men and a truck delivering material. The crew later was increased by four linemen and four groundmen, making a total of 21 men. A small, mobile unit was thus organized which could easily be moved long distances, which is an item of considerable importance on a line of this length.

Some figures on direct labor costs are of interest. A total of 4,707 suspension strings were changed at a unit cost of $1.77 per string, which is an unusually low cost for this class of work when compared with jobs on which the hot-stick method was not used. The dead end and semi-strain structures, 172 in number, were changed at a cost of $9.45 per structure, which again is much cheaper than this work could have been done by any method other than with live-line tools.

The results of this job would indicate

Reinsulating a 66-kv. line for 110 kv. with live-line tools at a cost of $1.77 per insulator string





that hot-line work is the most economical and practical method of handling reinsulation unless the line can be permanently taken out of service during the entire reconstruction period.

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Nearly 32,000,000 Kw. in Public Utility Plants

IN ONE year the rating of generators in public utility plants in the United States increased more than 2,300,000 kw., according to statistics published by the U. S. Geological Survey. The growth is equivalent to nearly 8 per cent. The total as of January 1, 1930, was 31,952,396 kw.

Meanwhile both the operating companies and the plants decreased in numbers, giving increased concentration of power. At the beginning of 1929 the average rating was 7,800 kw.; a year later it was 8,450 kw.

It appears that about 73 per cent of the total generator capacity is driven by steam power, 26 per cent by water power and 1 per cent by internal-combustion engines.

These statistics include all agencies contributing to the energy supply for public use; about 93 per cent is in plants for electric light and power. Plants of less than 100 kw. are omitted, consequently the number is somewhat smaller than that given in tabulations in which all sizes are included; the effect on the total rating is negligible.

In addition to the statistics by geographical regions, here abstracted, the report gives corresponding data for 1930 for each state.

It also contains final figures, likewise by divisions and by states, on output and fuel consumption, the former differing but slightly from the preliminary figures made public earlier in the year and quoted in the ELECTRICAL WORLD of March 8, 1930, on page 510.

The revised totals follow:

	Kw.-Hr.
Energy Output	
Total	97,352,385,000
From water power	34,628,994,000
From fuel	62,723,391,000
Fuel Consumption	
Coal (short tons)	44,937,230
Oil (barrels)	10,124,216
Natural gas (M.cu.ft.)	112,706,617

Simple Devices Prevent Freezing of Sluice Gates

PROBLEMS presented by the formation of ice on sluicegates in northern climates, and the consequent freezing of those gates in place, are being solved satisfactorily by several companies in a variety of ways. The Southern Canada Power Company, which has 50 22-ft. housed gates, has kept its gates in operation for three years by heating them with hot air. A small blower with a ¼-hp. motor blows the air over heaters and thence over the gates. This heating is reported to be accomplished with the low heat consumption of 16 or 17 watts per square foot of gate surface.

The Abitibi Paper Company heats a 20 x 20-ft. gate in a similar manner with a consumption of approximately 30 kw. Another sluicegate freezing-prevention system consists of heating the bedded parts of the gates by using nichrome wire supported on porcelain knobs fastened to channel iron. In this case more of the heat is applied to the bottom of the gate than to the top.

One method of keeping ice off the gates is the use of the bubbler system, which keeps the ice thrust from pushing on the skin plates or parts of the gates. This is accomplished by forcing air at 80 lb. pressure through a battery of orifices 1/32-in. in diameter which are located 15 ft. below the water level. The Southern Canada Power Company uses bubbler systems, with nozzles 1/32-in. in diameter and 4 ft. below the water level, on its flashboards. It consumes about 34 cu.ft. of air at 80 lb. pressure for 100 ft. of the channel.

Keeping surge tanks free from ice also is a problem of consequence. The use of a floating anchored telegraph pole for breaking up the ice in a surge tank and keeping the parts free is one satisfactory remedy to that difficulty. The surge tank heating system at the Trenton Falls plant of the Utica Gas & Electric Company consists of steam coils having partitions installed so as to insure the circulation of air.

Along with the elimination of frozen sluicegates and surge tanks comes the prevention of ice formation on trash racks. One five hundred and fortieth of a degree F. rise in temperature is sufficient to keep the racks ice-free. This was accomplished electrically by one company at an energy consumption of 400 kw. as compared to 1,800 kw. when the rack was first installed.

Public Utility Power Companies in the United States and Capacity of Generators

	January 1, 1930						January 1, 1929		
			Capacity of Generators in Kilowatts						
			Operated by						
Division	Operating Companies	Plants	Water Power	Steam	Internal-Combustion Engines	Total	Operating Companies	Plants	Capacity of Generators (Kilowatts)
United States	**1,628**	**3,780**	**23,255,692**	**8,316,591**	**380,113**	**31,952,396**	**1,720**	**3,795**	**29,629,702**
New England	159	321	2,039,756	605,149	5,757	2,650,662	173	329	2,556,095
Middle Atlantic	164	413	6,586,965	1,259,707	20,141	7,866,813	197	424	7,406,027
East North Central	319	697	6,959,714	580,597	22,712	7,563,023	333	705	6,754,252
West North Central	366	704	1,772,797	331,341	112,188	2,216,326	371	691	2,068,058
South Atlantic	189	429	2,243,019	1,601,161	38,537	3,882,717	200	433	3,754,343
East South Central	88	214	719,166	818,516	25,364	1,563,046	91	222	1,497,282
West South Central	139	432	1,294,294	19,023	114,371	1,427,688	146	434	1,238,618
Mountain	131	290	315,854	761,563	32,641	1,110,058	131	281	972,795
Pacific	73	280	1,324,127	2,339,534	8,402	3,672,063	78	276	3,382,232

Electric Heat in Newspaper

By J. H. FAULKNER

Commonwealth Edison Company, Chicago, Ill.

ELECTRIC HEAT applicable to all needs of newspaper production—melting of line castings and stereotyping, remelting of slugs and scrap, heating of flatwork castings and making electrotypes, scorching matrices, electrotype baths and wax tables.

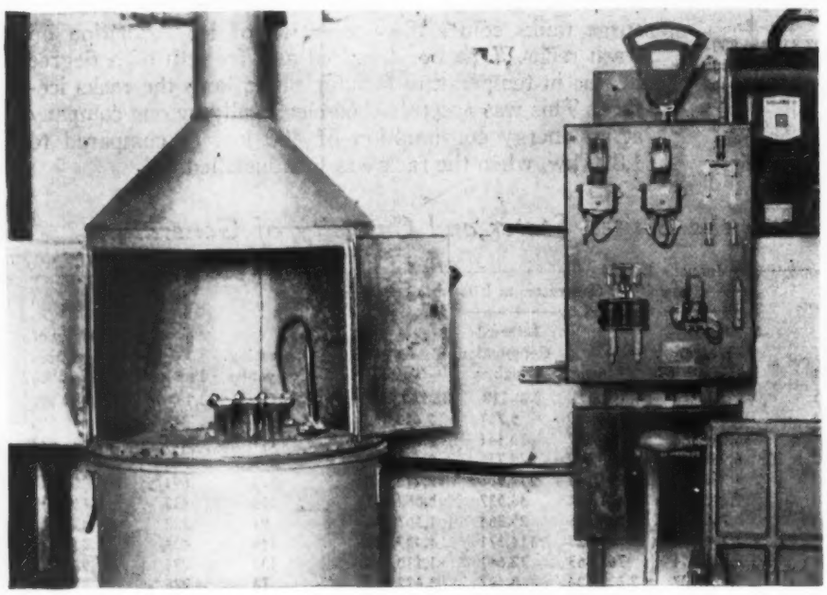
AMONG advantages are better working conditions, more efficient utilization of space, automatic temperature control, uniform heat, flexibility, high speed, less wastage.

ELECTRIC heat is used today for many purposes in the production of a modern newspaper, the most modern of which are line castings and stereotyping. Other applications include the remelting of line-casting slugs and small scrap into cakes for re-use in typesetting machines, the heating of metal for flat work castings and making electrotypes. It is also used in matrix scorchers, electrotype plating bath and wax tables.

Before electricity could be applied to the heating of the large quantities of metals used each day for producing a newspaper it was necessary to design the heaters so their failure would never delay an edition. This was especially true with reference to stereotyping, as many newspapers have only one stereotype furnace and it must cast several tons of metal every day with never-failing regularity. The original type of heating unit designed for melting type metal consisted of nickel-chromium wire wound in the form of a helix and placed inside a steel tube, the space between the turns of the helix and between the helix and the sheet being solidly packed with a dense electric insulation material. This unit can be formed into any particular shape and the length and size of wire govern the amount of heat for each particular unit. This original idea of the sheet wire unit is still in use today and in many different applications. It must be borne in mind that in most cases mechanical equipment was taken as it was and electric heaters designed particularly for that application. Consequently there is very little standardization of heating unit design.

Automatic temperature control is necessary on account of the varied production and the fast heating of the unit. One form of control is a thermostat which depends for its operation on the differential expansion between steel and aluminum bronze connected through a system of levers to a contact switch. Another form is the mercury-actuated type, having a sensitive bulb connected to a Bourdon tube carrying contacts, the bulb and tube system being filled with mercury.

During the last three years electric heat has probably made its greatest contribution to the printing industry by being successfully and extensively applied to the heating of stereotype metal. At the present time there are approximately 130 installations in the United States in both large and small newspapers and including furnaces consuming 15 to 360 kw. and melting 800 to 25,000 lb. of metal per hour. The installations now in service repre-



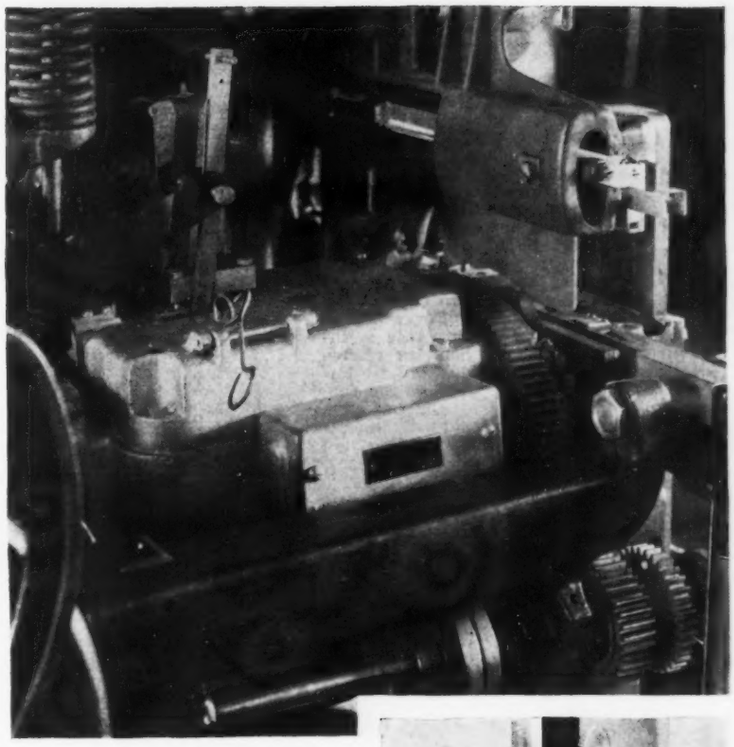
Melting pot for slugs and scrap

In most newspaper plants melting pots are required for remelting type metal, used by the intertype, linotype and monotype machines for miscellaneous flat casting and the making of electrotypes. The three-unit, 15-kw. melting pot at the Detroit *Times* will hold approximately 1,200 lb. of metal and will melt approximately 1,000 lb. per hour; much more than is generally required for this class of work. Similar pots are available with bottom pour spout.

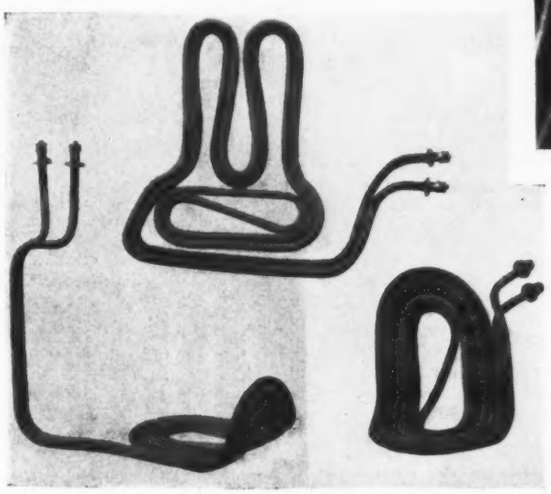
Production

and P. H. CLARK

Industrial Heating Department,
General Electric Company, Schenectady, N. Y.



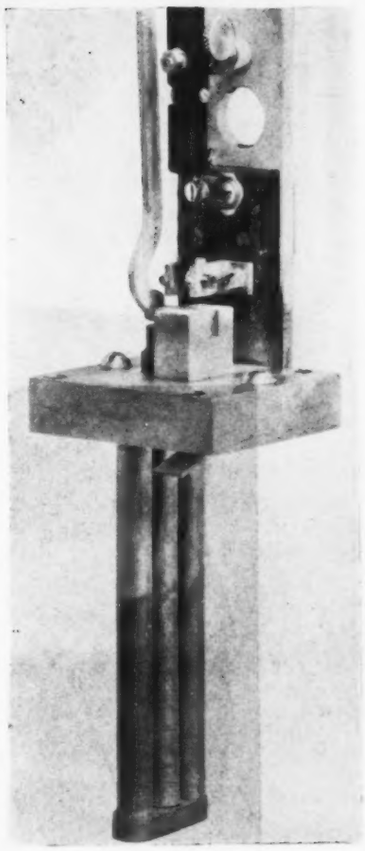
Heating units made in various shapes



The units consist of nickel-chromium wire wound in the form of a helix and between the helix and the sheath being solidly packed with a dense electric insulating material. The unit can be formed into virtually any desired shape. These "helicoil" units are designed for placing in pockets on the outside of the intertype melting crucible, one on each side and one under the throat. The side heaters require approximately 625 watts each and the throat unit 500 watts. Should one of the heaters fail, it can be quickly replaced, even though the metal in the pot has become cold.

On a line casting machine

Probably the first important application of electric heat in the printing industry was for heating the melting pots of line-casting machines such as the intertype, linotype and monotype and typesetting machines. Large numbers of these machines are now equipped with electrically heated melting pots and they have proved reliable and dependable. It is safe to estimate that over 60 per cent of these machines in operation in this country are heated by electricity.



Automatic heat control is necessary

This type of thermostat depends for its operation on the differential expansion between steel and aluminum rods, amplified by a system of levers, to actuate a movable contact arm between a pair of stationary contacts. All working parts can be readily removed or replaced.

sent about 12,000 kw. From the total newspaper circulation of the country it may be said that the total potential load is approximately 90,000 kw.

There are many reasons for this rapid change to electric heat: First, for the men employed more comfortable working and better health conditions have been brought about by the elimination of dirt, soot and obnoxious and vitiating gases. Also, because of the absence of coal oil or gas fires and the application of heat insulation to all sides, including the bottom, room temperatures are much lower. Second, better stereotype plates are obtained. They slip on the press without fitting (probably because of the more uniform temperature of the metal), less material is wasted because of fewer remelts that cannot be used because the temperature was too high or too low. Third, there is confidence that there will be plenty of metal at all times, even during the busiest periods, and that there will be no delay because of failure of equipment due to leaky pots, broken grate bars and the like, all of which are important to the publishers as assuring smoother operation of the plant.

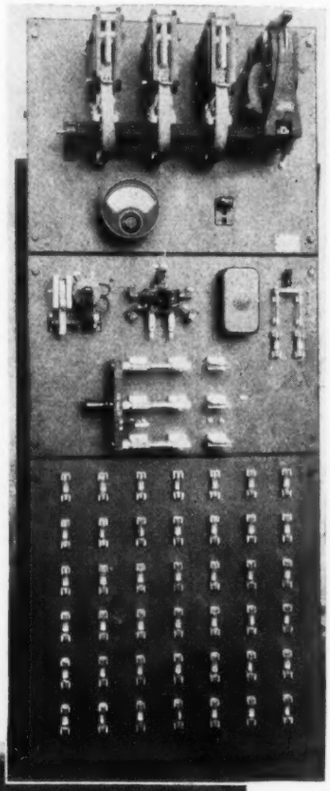
These facts are readily recognized by users of electric

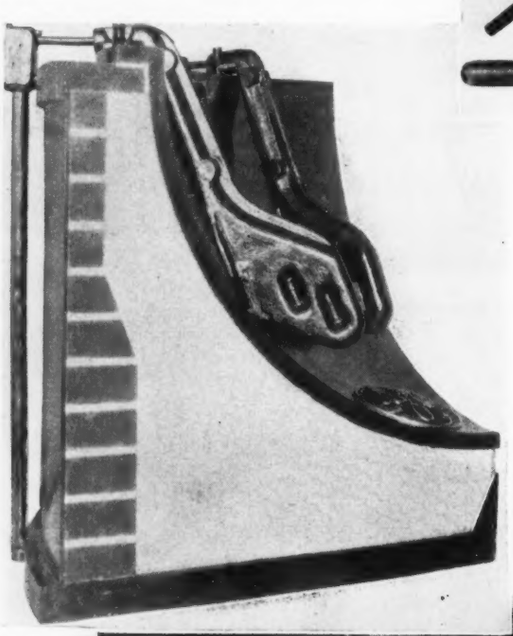
The units are hung over the lip of the pot

A set of units can be installed in an existing fuel-heated furnace during a week-end shutdown, without delaying an issue. Since each unit furnishes only a small portion of the total heat, a single failure would cause no inconvenience or delay. Additional heaters can be added as only a few minutes are required to connect the heater to the power lines. For every 5-kw. heater added, the melting rate is increased about 400 lb. per hour, or of five plates per hour. Since the heaters are immersed in tthe metal, no part of the furnace can reach a temperature higher than that of the metal, thus eliminating crucible strains.

A stereotype pot control panel

Each heating unit is protected by a separate fuse. The usual control, as this, is manual and consists merely of star-delta shift.



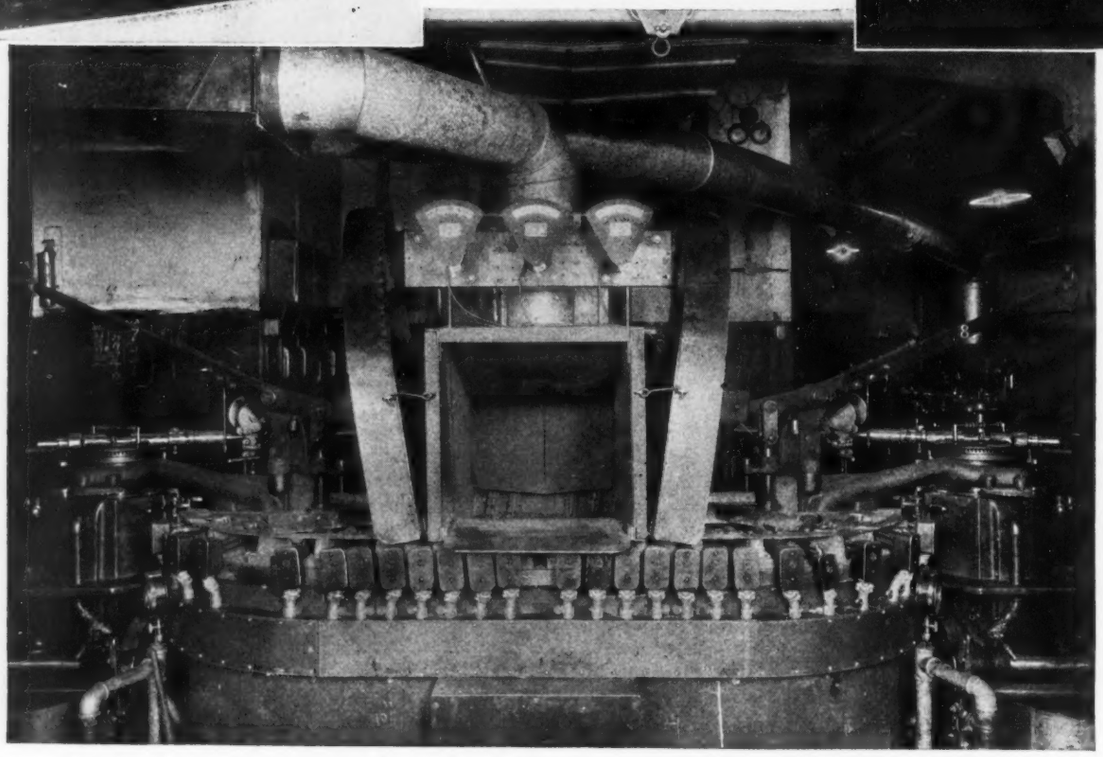


Temperature controller

This is a Bristol instrument, scale 200 to 1,000 deg. F., equipped with armored connecting tubing and special bulb inserted in a cast-iron well for immersion in the molten metal.

A Wood stereotype pot

The New York *Times* has five of these pots, each equipped with 3,000 kw. of heaters.

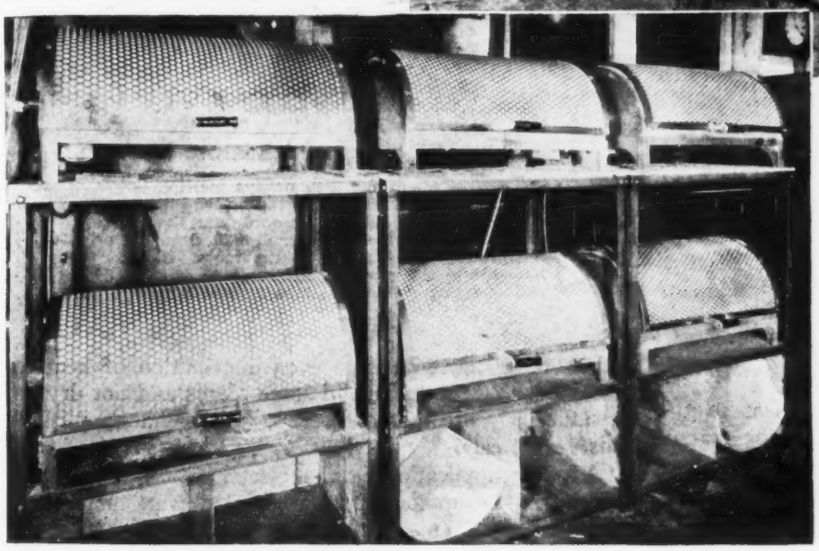


Wax tables and kettles steam heated by electricity

Two 2-kw. electric steam generators built in as an integral part of two 16-in. wax kettles provide a working steam pressure of 40 to 50 lb.

Matrix scorchers

Each one of these six has 3 kw. in electric heat. More than 100 of these units are now in successful operation.

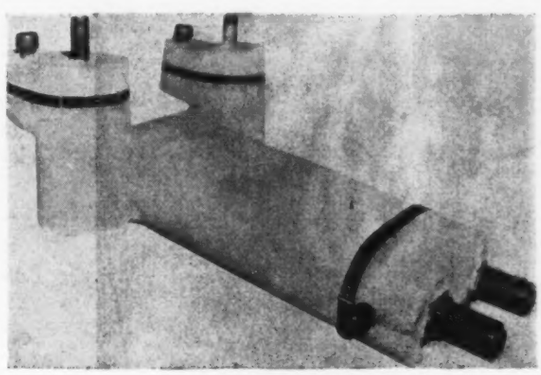


heat, and in most instances they would be well satisfied with the results, even at a considerably greater fuel cost. However, it is not an uncommon report to find that the fuel bill is less than before the change and the common report to find that it has not increased. It was first said that electric heat was too expensive for the advantages obtained. The facts as reported by users everywhere do not bear out this statement.

When equipped for electric heating stereotype furnaces have a much higher melting capacity than when fuel-heated, thus increasing considerably the output of an existing equipment. Electric furnaces will easily supply metal at the rate of one plate per hour (80 lb. gross) for each kilowatt installed.

The popular sized 8-ton furnace has usually 200 kw. installed and will supply metal at a rate exceeding 200 plates per hour. Often 300 kw. is installed, which is about the maximum without removing the agitators. This is sufficient for more than 300 plates per hour and the furnaces will melt hour after hour at this rate. Those familiar with stereotyping equipments will appreciate that this is an enormous output compared with fuel-heated furnaces. In some cases the agitators have been removed, affording additional space for heating units and still further increasing the melting capacity.

It is estimated that an existing 8-ton furnace can be made to produce nearly 350 plates per hour. With slight modifications which can be embodied in new design, it is estimated that 400 plates per hour can be produced. Manufacturers are now offering higher speed casting equipment which will produce eight plates per minute, or 480 plates per hour, from one furnace. These machines were developed largely because of the high melting rate obtainable with electrically heated furnaces. As a result of this higher melting capacity it would probably be possible in the average plant to use smaller furnaces than are now installed. This, of course, means a lower capital charge, less floor space, lower



The electric boiler

This is a 10-kw. unit, made by the Electric Steam Generator Company and equipped with two 5-kw. immersion type units.

heat losses due to smaller size and generally better economy. While such considerations apply particularly to new installations, where full advantage of these facts can be taken, the possibilities in existing plants should not be overlooked. For example, it may be that an 8-ton furnace would do the work of two 5-ton furnaces now in use much more efficiently and allow a good margin for growth as well as saving floor space. The power consumed per unit of metal melted will depend on the size of the furnace, the number of hours idle and the rate of melting during the casting period.

There is every advantage in operating electrically heated furnaces at or near their full melting capacity, and there is no disadvantage whatever, either from the standpoint of the electrical equipment or of the crucible. The individual units are designed for a certain definite output and they take only that amount. Therefore they cannot be forced above their ratings. It is only necessary to have enough units installed to do the work required, and it is a very simple matter to add units if the requirements should be increased. These units are so simple, so ideally suited to the work and so easily applied that the reason for their popularity can be readily understood.

The stereotype furnaces are by far the largest users of electric heat in a newspaper plant, but in addition to these there are other applications worthy of mention. The same general characteristics that apply to stereotype furnaces apply to nearly all metal-melting pots, such as for remelting type, miscellaneous flat casting and for the making of electrotypes.

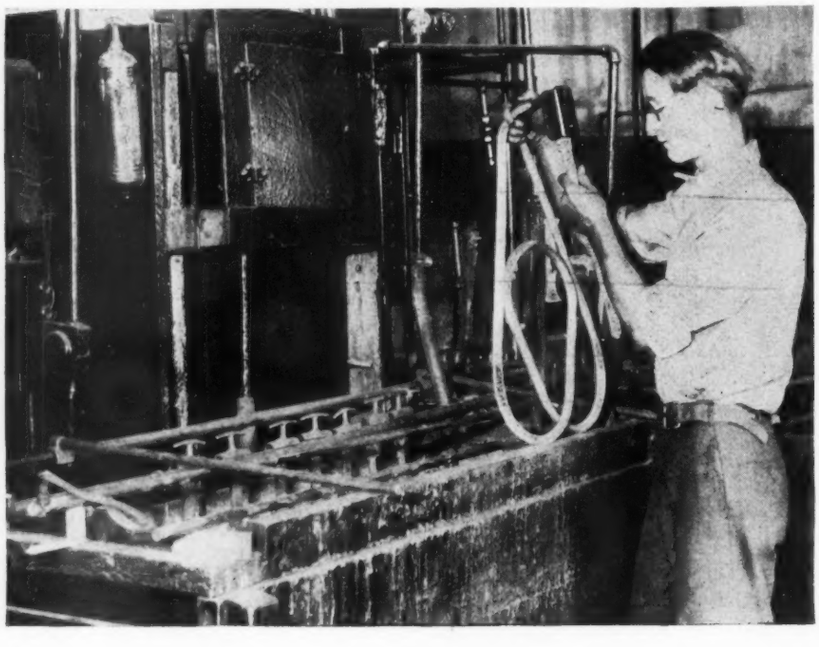
Monotype pot and heating unit

The equipment for a monotype melting pot is somewhat different from that for intertype; there is no throat to be heated and the metal temperatures sometimes reach 850 deg. F. A unit immersed directly in the metal is better adapted to the purpose. It consists of a "helicoil" heating element molded in cast-iron.

Electric heat uses are diverse

Another recent contribution of electric heat to the newspaper industry is the electric scorcher or matrix drier. As soon as the electrically heated stereotype furnace became popular the stereotyper quite naturally desired that his scorcher be heated by electricity. In some cases home-made scorchers were built and were considered very satisfactory by the builders. A successful scorcher must have an even distribution of heat to avoid burning the matrix in some places and not drying it sufficiently in others. Electric heat has accomplished this very nicely.

Another application is the electric steam generator, which can be applied to steam-heated wax tables and wax kettles. This generator contains only a small amount of water, a part of which is constantly being made by the steam condensed in the table and run back to the boiler again. The small amount of water required enables steam to be produced quickly when starting out. All these developments of the past few years have made substantial and practical electric heating equipment available to meet all of the requirements of a modern printing plant. These devices are of simple and strong construction, require little attention or maintenance and add greatly to the efficiency of the plant.



Lead-coated immersion unit for plating baths

Only the lower half of the unit is active, so that it may be used in tanks having considerable variation in the liquid level. The units are light and portable.

Newspaper offices are, of necessity, located in congested areas, where property values are high and floor space is valuable. Equipment that will give a higher output and at the same contribute to the comfort and efficiency of the employees is of great importance in this industry. That electric heat contributes substantially to this is shown by the rapidity with which it is being adopted by representative plants throughout the country.

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5 to 200 Cycles Measured Within One-tenth Cycle

FREQUENCIES from 5 to 200 cycles per second can now be measured more rapidly and conveniently than has heretofore been possible by the oscillograph and without the difficulties encountered in the direct-reading frequency bridge method at low frequencies, according to the Bureau of Standards.

The principle of the new method is as follows: The alternating current, the frequency of which is to be determined, is applied to a polarized relay. On one-half of each cycle the contactor, which is connected to one side of a large condenser, is drawn to one contact, and the condenser charged to the voltage of a battery. On the other half of each cycle the contractor moves over to the other contact, discharging the condenser through a resistance. If the time constants of the circuits are kept low enough so that charge and discharge are practically complete, then it is apparent that the quantity of electricity passing through the discharging resistance per second, or the average current through the resistor, is directly proportional to the number of times per second the condenser is discharged, and hence is directly proportional to the frequency of the alternating current which is applied to the relay.

The average voltage drop across the discharging resistor is also proportional to the frequency of the alternating current. This average voltage is balanced, through a sensitive galvanometer and high resistance, against a known fraction of the total voltage drop along a slide-wire resistance, shunted around a storage cell. The slide wire is divided into a thousand equal divisions. It is set at 1,000 and an alternating current of 100 cycles per second applied to the relay; the capacity and resistance of the discharge circuit are then varied until the galvanometer reads zero. Then if an alternating current of some lower frequency is applied the slide-wire setting is changed until the galvanometer again reads zero, the other circuit conditions remaining constant The unknown frequency can be read directly from the calibrated slide wire

The accuracy of this method for the frequency range from 5 to 200 cycles per second is within one-tenth of a cycle, according to the Bureau of Standards.

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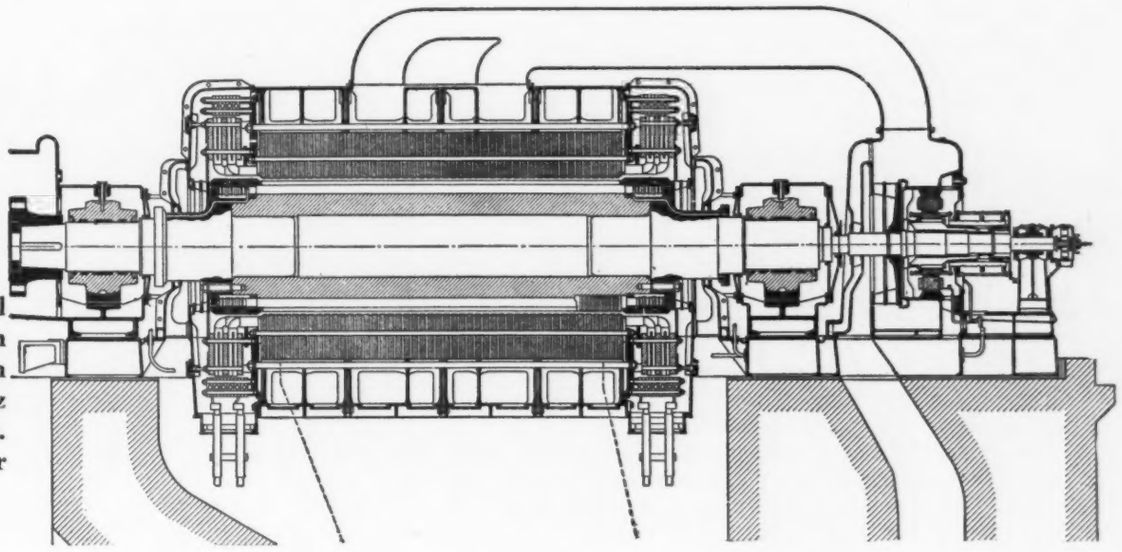
100,000 Kva. in Single-Unit Turbo-Generator

WHAT is believed to be the largest single-unit turbo-generator in existence has recently been added to the power house at Zschornewitz, chief contributor to Berlin's supply. The unit is rated at 100,000 kva., 1,500 r.p.m. and weighs 300 tons, giving a specific weight of only 6 lb. per kilovolt-ampere.

The rotor is a tube, forged from one piece of high-grade chromium-nickel steel, and into its ends are heat-shrunk two short lengths of shafting. To insure an absolute rigid connection between these two shafts and the rotor tube a set of twelve 4-in. bolts at each end clamp these joints together. At the time this rotor forging was ordered the steel mills were unable to furnish a large enough tube into which slots for the field winding could have been milled. Therefore it was necessary to insert individual steel bars lengthwise in the surface of the tube to form the slots. The mechanical design of the rotor assures 200 per cent safety at the critical speed of 1,950 r.p.m. The length of the active iron on the rotor is 15 ft. The normal peripheral speed reaches the high value of 440 ft. per second or 300 m.p.h.

On account of its size the stator had to be shipped in



Longitudinal section through Zschornewitz 10,000-kw. generator

COMPARATIVE EXCAVATING COSTS

Taken from a report of the Commercial Section, Southwestern Division, N.E.L.A., based on use of 1½-yd. dragline or a 2-yd. shovel and continuous digging. Under intermittent operation the cost will increase as the amount of work done is reduced.

Ten-Hour Shift	Electric	Gasoline	Diesel	Steam
Yards stripped, dragline..	1,100-1,500	900-1,250	1,100-1,500	1,100-1,600
Yards loaded, dragline....	900-1,200	750-1,000	900-1,200	900-1,250
Yards loaded, shovel.....	1,000-1,800	800-1,400	1,000-1,800	1,000-2,000
Power or fuel consumed..	400- 500 kw.-hr.	80- 120 gal.	30- 40 gal.	400- 600 gal.
Unit cost of power or fuel delivered to machine, cents.....	1.75	15	6	3½
Water consumed, gallons..	.....	5	2	4,000-5,000
Water cost per 1,000 gal. delivered to machine...	.....	.....	.....	$2.50-10.00
Daily power to fuel cost..	$7.00- 8.75	$12.00-18.00	$1.80-2.40	$14.00-21.00
Operator.....	6.50	6.50	6.50	6.50
Oiler or fireman.....	.....	3.50	4.00	3.50
Pitman.....	3.50	2.50	2.50	2.50- 5.00
Water.....	.....	0.50	0.25	4.00-25.00
Lubrication.....	1.00	2.50	2.50	3.25
Maint. engines, boilers, motors and control, etc.	0.50	1.50	1.50	2.00
Maint. balance of machine	2.00	6.00	5.00	3.00
Excavating cost per ten-hour shift.....	$20.50-22.25	$35.00-40.50	$24.05-24.65	$38.75-69.25
Cents per yard stripped, dragline.....	1.37- 2.02	2.80- 4.50	1.60- 2.24	2.42- 6.30
Cents per yard loaded, dragline.....	1.71- 2.47	3.50- 5.40	2.00- 2.74	3.10- 6.92
Cents per yard loaded, shovel.....	1.14- 2.22	2.50- 5.07	1.34- 2.46	3.87- 7.70
Fixed Charges				
First cost, 1½-yd. drag...	$24,500	$24,500	$30,000	$22,500
First cost, 2-yd. shovel...	26,500	24,800	30,500	23,000
Life of machine, years....	10	7	8	10
Rate of depreciation, per cent.....	10	14.3	12.5	10
Average rate of interest (8 per cent on average lifetime value) per cent.	4.40	4.57	4.50	4.40
Taxes and insurance (2 per cent on average life-time value) per cent....	1.10	1.14	1.12	1.10
Total fixed charges, per cent.....	15.5	20.0	18.1	15.5
Annual Fixed Charges				
1½-yd. dragline.....	$3,800	$4,900	$5,430	$3,490
2-yd. shovel.....	4,110	4,960	5,520	3,670
Fixed charges per working day — (assuming 250 days per year)				
1½-yd. dragline.....	$15.20	$19.60	$21.70	$14.00
2-yd. shovel.....	16.40	19.80	18.20	14.70
Fixed charges per yard—				
Cents per yard stripped, dragline.....	1.01-1.38	1.57-2.18	1.46-1.97	0.88-1.27
Cents per yard loaded, dragline.....	1.27-1.69	1.96-2.62	1.81-2.41	1.12-1.56
Cents per yard loaded, shovel.....	0.91-1.64	1.41-2.48	1.01-1.82	0.74-1.47
Total Excavating Costs = Operation Plus Fixed Charges				
Cents per yard stripped, dragline.....	2.38-3.40	4.37-6.68	3.06-4.21	3.30-7.57
Cents per yard loaded, dragline.....	2.98-4.16	5.46-8.02	3.81-5.15	4.22-8.48
Cents per yard loaded, shovel	2.05-3.86	3.91-7.55	2.35-4.28	4.61-9.17

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four quadrants, each quarter comprising the cast-iron housing and ready-made steel laminations in place. At the site the four quadrants were bolted together and the bar winding was inserted in the slots. The three-phase, 50-cycle winding furnishes 13,000 volts at 4,550 amp.

As customary for very large generators of this type, a closed ventilating system is used to carry heat losses away. A double air impeller was mounted close to the armature of the direct-coupled main exciter, furnishing 2,700 cu.ft. of air per second. A large square steel duct, extending from above the exciter, carries this cooling air into the stator of the generator and through cooling chambers at the right and left of the machine. It is noteworthy that the generator delivered power only sixteen months after its order was placed. A sectional drawing of this large machine, reproduced from the June issue of *Siemens Zeitschrift*, is shown herewith.

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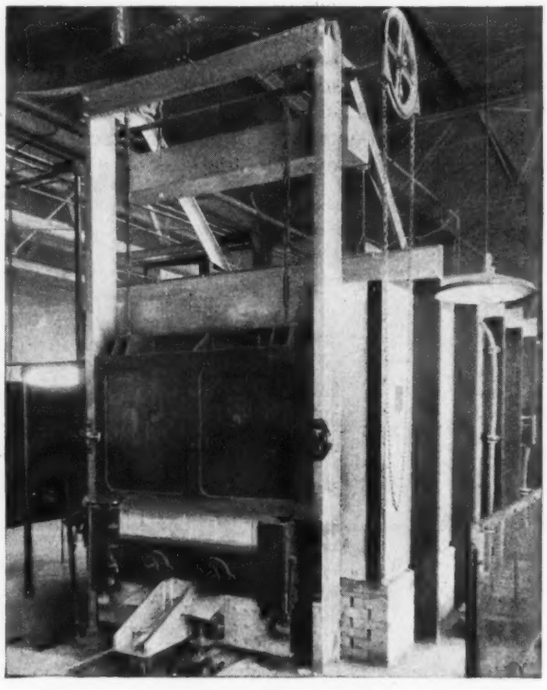
Electric Annealing Chosen After Trying Oil and Gas

FOLLOWING earlier installations of oil and gas furnaces for annealing file blanks and tools, the Heller Brothers' Company of Newcomerstown, Ohio, has adopted electric heat for this purpose. According to R. H. Anders, power engineer Ohio Power Company, Coshocton, Ohio, the furnace has proved highly satisfactory in results as well as in operating cost.

Fuel oil was first used in annealing the file blanks, but was thrown out due to high cost and trouble in regulating heat. On a basis of 6 tons of steel, it required 218 gal. of fuel oil.



File blanks and tools annealed here with 293-kw.-hr. per ton

Gas was next tried at a saving of cost over the oil and resulted in a more uniform heat control and reduced expense for cleaning of burners and general repairs. The gas consumption for 6 tons of steel was 27,000 cu.ft. of 1,000 B.t.u. natural gas.

The electric furnace shows a fuel economy of 1,760 kw.-hr. for 6 tons net steel and shows a more uniform anneal and the saving of one-half a man's time due to its automatic operation. Maintenance costs and repairs are said to be materially less than with the fuel-fired equipment.

The furnace, manufactured by the Electric Furnace Company of Salem, Ohio, was installed primarily to meet an increased demand for annealed file blanks. It is rated at 225 kva. and has a capacity of 6 tons of steel. The furnace peak does not coincide with the mechanical load of the plant and thus results in a higher plant load factor.

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READERS' FORUM

Suggests Intermittent Signal to Remind of Hazards

To the Editor of the ELECTRICAL WORLD:

On many occasions the fact has been mentioned in your columns that fatal electrical accidents have occurred to the skilled workman and that there is a psychological reason for this. I have often been particularly impressed with the idea that, after the efforts of many have been expended in providing safe equipment and well-informed personnel, safety, in its final analysis, lies entirely in the hands of the man whose duties place him in hazardous locations. Since his safety, his family's livelihood and his employer's good will and financial responsibility are so vitally affected let us consider this man's situation.

Nature has endowed him with five senses with which to detect danger. In man's evolution the electrical hazard is so recent that no sense has been developed to detect the nearness of this type of danger before it is too late to protect his person. It will not register a warning on any of his five good senses. For this reason this man is master of the situation only by virtue of his knowledge of the situation—by his conscious mind. His protection, then, being a purely mental process, is good until his mind is diverted. He has but one mind.

Under such circumstances many good men have erred, with disastrous results, through momentary mental diversion.

His protection can best be accomplished by physical separation from hazards, when possible, and by keeping him constantly warned of the proximity of any remaining hazards. Current practice is to station another person to watch and verbally warn this man. This method is good, but subject to human laxity and resentfulness.

One method has been suggested as a supplement to present practice. The idea embodies the use of a small, spring-operated gong to be used as an intermittent reminder of the existence of danger, somewhat as intermittent gongs are used at unguarded railroad crossings. In operation the device would be wound, set in operation and placed by the workman in a convenient location, preferably between the man and his hazard. The following points may be considered:

1. There is always a certain reluctance on the part of a man being warned, and of the warning party, to verbal warnings. This inanimate gong started by the man himself would help him to avoid mental diversion.
2. By having the gong strike single notes five or ten seconds apart, it would not be ignored through familiarity.
3. By requiring its use the thoughts of the man and his associates would be more impressed with the safety idea as an important part of the work.
4. It would be one additional argument in court.
5. Its cost should be slight, and as a supplement to present safety practices its value would be great if it prevents one serious accident.

A continuous buzzer might be more effective than an intermittent gong.

W. W. PALMER.

Birmingham, Ala.

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Contends Welding Speeds Are Higher

To the Editor of the ELECTRICAL WORLD:

In your issue of August 16, 1930, under the heading "Arc-Welded Boilers Not Far Off," is a very valuable and hopeful discussion by G. E. Koch of the Westinghouse company that is of real benefit.

Inadvertently, undoubtedly, he has given information under speeds of arc welding that are so far from the facts that they cannot be allowed to go without criticism. It is rather difficult to know how such an error occurred. Mr. Koch shows welding speeds by manual operation of

Feet per Hour	Thickness of Plate (In.)
3	$\frac{1}{2}$
4	$\frac{3}{8}$
6½	$\frac{1}{4}$
9	$\frac{3}{16}$
15	$\frac{1}{8}$

with currents running from 250 amp. to 125.

Welding speeds several times these figures are being obtained in countless places at this time by manual operation. In general, the currents used will be very considerably higher than the figures mentioned.

The same thing is true with automatic welding, which shows welding speeds as follows:

Feet per Hour	Thickness of Plate (In.)
15	$\frac{1}{2}$
23	$\frac{3}{8}$
45	$\frac{1}{4}$
60	$\frac{3}{16}$
100	No. 12
120	No. 14
165	No. 16

In the heavier plate, namely, $\frac{1}{2}$ in., $\frac{3}{8}$ in., $\frac{1}{4}$ in. and $\frac{3}{16}$ in., speeds of more than double these are usual and are being obtained in many places. In the three lighter gages these speeds are considerably under the figures which are being obtained in many places, but are not proportionately as low as on the thicker plate.

The above information is offered not with the idea of criticism but with the idea of correcting a statement which is palpably false and is undoubtedly due to misinformation.

J. F. LINCOLN,
President.

The Lincoln Electric Company,
Cleveland, Ohio.

BOOK REVIEWS

Alternating Currents

By Calvin C. Bishop. New York: D. Van Nostrand Company. 317 pages, illustrated. Price, $2.

Alternating-current theory, machines and circuits for vocational and technical students are covered in this book. It uses simple mathematics, good illustrations and standard apparatus and circuits to develop the fundamentals of the topics treated. Typical chapters include alternating currents, alternators, inductance, capacity, series circuits, parallel circuits, rectors, transformers, asynchronous motors, synchronous motors and converters, tests and measurements. It is an introductory and practical text written from the background of an experienced teacher in a technical high school.

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High-Voltage Oil Circuit Breakers

By Roy Wilkins and E. A. Crellen. New York: McGraw-Hill Book Company. 296 pages, illustrated. Price, $4.

The authors of this book studied the modern oil breaker from the point of view of engineers on a utility property responsible for the purchase and use of breakers. They have assembled the design and performance data on modern oil breakers and discuss the application and operating features in a direct and practical manner.

The theme of treatment is a chronological account of oil breaker development, a discussion of oil breaker theory, descriptions of modern breakers and compilation of field test data. The theoretical treatment of arc phenomena is non-mathematical and embodies the prevailing theories of arc performance and oil breaker interruption effects. The recent new theory of Dr. Slepian is given, together with most recent breaker developments of the several manufacturers. A description and discussion of breaker accessory apparatus adds to the value of the work and the operating and field test data give tangible evidence of breaker performance.

In the main, therefore, this book paints a background for the modern oil breaker. If read by the engineer or student, it gives a knowledge of the developments that have occurred and of the latest designs of breakers. It is a worthy contribution to switching literature.

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Die Wasserkraftwirtschaft Deutschlands

Issued by the Deutsche Wasserwirtschafts- und Wasserkraft-Verband E. V. (Berlin-Halensee, Joachimstrasse 50). Berlin, NW7: VDI-Verlag GmbH. 391 pages, 123 plates, numerous tables and cuts. Price, 25 reichsmarks.

This fine volume can be recommended as the latest word on German water-power developments. It is a special publication issued in connection with the Second World Power Conference, Berlin, June, 1930, and, therefore, has features contributing both to its value and to its attractiveness that could scarcely be included at the stated price if the book were a purely commercial venture.

The major portion of the book is devoted to detailed data and descriptions, hitherto unpublished, of the more important plants. The index shows that these run into the hundreds. The descriptions are based throughout on official data and have for the greater part been provided by national and state governmental departments, which co-operated with the sponsoring organization. The textual matter is supplemented by numerous excellent illustrations and maps. The grouping, by states and systems, brings related developments together.

In addition there are general articles dealing with the fundamentals of water-power exploitation.

In view of the very rapid progress made during the past few years this comprehensive presentation is most opportune. Its appearance will be welcomed both by specialists and by general readers, in particular by engineers, financiers and others who want detailed and authoritative data on German water power.

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Predpisy ESC 1930

(Regulations of the Czechoslovak Electrical Association, 1930 Edition.) Praha: Elektrotechnicky Svaz Ceskoslovensky. 216 pages.

Officially adopted specifications to govern electrical practice have been combined in one volume, available in Czechoslovak and in an authorized German translation. A large part of the book is devoted to the code governing construction and installation. In addition there is a remarkably full list of symbols and abbreviations; every element would seem to have been covered that can conceivably appear in any kind of electrical diagram or layout, or in any ordinary formula. References to laws and ordinances cover 35 pages; 25 pages of definitions follow. The whole is adequately indexed and constitutes an authoritative manual of standard practice in Czechoslovakia.

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Die Wirtschaftlichkeit der Energiespeicherung für Elektrizitatswerke

By Dr.-Ing. Ludwig Musil. Berlin: Julius Springer. 142 pages, 89 illustrations. Price, 18 reichsmarks.

The subject of energy storage, including its economic aspects, has lately received considerable attention. Usually only one type of storage has been under consideration, often only a specific case. Generalized consideration of the subject has thus far been lacking, the author points out.

It is the purpose of the present book to supply this lack by dealing comprehensively with the economics of energy storage for electrical systems, whether they be operated on fuel, on water power or on a combination of both, and whether the energy be "raw" or "elaborate." Its scope is, therefore, sufficient to include all forms of storage—the impounded stream as well as pumped storage and the steam accumulator—although these latter forms properly receive the greater attention.

The proposed plan almost of necessity results in a presentation that savors of the academic. And yet its generalized equations, in typical curves, are in a familiar language to the engineer. Energy storage is here viewed as a part of the general problem of equalizing the output of the most expensive elements of the plant while supplying a fluctuating demand.

Men of the Industry

F. B. Hofft Becomes President of Commonwealth Utilities

FRED B. HOFFT, a vice-president of the United Gas Improvement Company, has been elected president of the Commonwealth Utilities Corporation to succeed Wiley F. Corl, resigned. Mr. Corl will devote all his time to U.G.I. interests. Mr. Hofft was identified with utility properties in the Middle West before transferring his interests to the East as general manager of the Olean (N. Y.) Electric Light & Power Company. Subsequently he became vice-president of the Erie (Pa.) Lighting Company, and when that company became a part of the Penn Public Service Corporation in 1923 he was elected vice-president in charge of operations for the northwest region. In 1927 he was placed in charge of all Pennsylvania properties. It was toward the close of last year that he was named a vice-president of the United Gas Improvement Company.

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FRED D. GORDON, vice-president and general manager of the Cumberland County Power & Light Company, Portland, Me., has been elected president of the Portland Chamber of Commerce.

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EUGENE H. ROSENQUEST, JR., has been appointed manager of the trades relations division of the Westchester Lighting Company, Mount Vernon, N. Y. Mr. Rosenquest entered the employ of the company in 1928, as representative of that division. The following year he was made supervisor of the division.

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FREDERICK G. HARRIMAN, assistant superintendent of distribution of the Narragansett Electric Company since last October, has been named superintendent of distribution of that company to succeed Ralph P. Ormsbee, who has assumed new duties. Mr. Harriman has been associated with the distribution department since the spring of 1929. Since his graduation from Harvard in 1915 he has been affiliated with the electric utility industry, concentrating especially on distribution work.

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W. HOWE SADLER, for the past two years with the editorial department of the Louisville (Ky.) *Courier Journal*, has been named manager of the public information and advertising departments of the Kentucky Utilities Company, an Insull property. Mr. Sadler went to Louisville four years ago from Atlanta. He is a native of Logan County, Arkansas, and attended the University of Arkansas and Kansas University. He began his newspaper work with the *Daily Capital*, Topeka, Kan.

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N. G. Reinicker Heads Pennsylvania Association

N. G. REINICKER, general manager of the Pennsylvania Power & Light Company, has been elected president of the

Pennsylvania Electric Association. Mr. Reinicker is a native of Baltimore and a graduate of the Baltimore Polytechnic Institute and of Cornell University in mechanical and electrical engineering. Following graduation in 1911 he became identified with the Detroit Edison Company, working on the operation, maintenance, design and construction of steam-electric power stations. At the end of five years he removed to New York, where he engaged in the same kind of work for the New York Edison Company. From 1918 to 1919 he was general superintendent for the E. I. Du Pont de Nemours Company at the Old Hickory smokeless powder plant of the U. S. Government at Nashville, Tenn.

In the summer of 1919 he joined the Lehigh Navigation Electric Company in charge of the operation and maintenance of the steam-electric stations. This company was later merged with others into the Pennsylvania Power & Light Company, and from that time he has held various positions in connection with the operation of the Pennsylvania Power & Light properties. Since November, 1928, he has held the position of general manager of the company.

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FRANK S. CLARK, consulting engineer, Stone & Webster Engineering Corporation, returned from an extended visit to Europe last week. Mr. Clark attended the World Power Conference and then visited several European countries to study recent power development.

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RALPH P. ORMSBEE, who has been superintendent of distribution of the Narragansett Electric Company, has been appointed assistant general manager of that company to fill the vacancy resulting from the transfer of Newell A. Clark to Quincy. Mr. Ormsbee assumes his new duties with a background of more than thirteen years of service with the Narragansett Electric Company. During this period he has had a wide experience in various phases of distribution work, culminating in his appointment as superintendent of distribution last year.

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OBITUARY

CHARLES D. KNIGHT, formerly manager of the Bloomfield plant of the General Electric Company, died September 5 at his home in East Orange, N. J., in his fifty-ninth year. Mr. Knight had returned two weeks ago from Bad Nauheim, Germany, where he had been for his health. When he retired he had been connected with the General Electric Company for 35 years.

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JOHN KIMMEL, prominent business man and organizer of the Wayland (N. Y.) Light & Power Company, died at his home in that city September 3. He was 63 years of age. It was in 1890 that Mr. Kimmel started the formation and operation of the power plant in Wayland. He also organized two large canning companies and was president of the Kimmel Hardware Company. In 1915 he purchased the Silver Creek Electric Company at Silver Creek, N. Y. Both the Wayland Light & Power Company and the Silver Creek Electric Company were sold to the Associated Gas & Electric Company about two years ago.

Financial and Statistical News

THE securities markets are moving more than ever on future prospects rather than past occurrences. News developments are anticipated farther in advance than normally, hence the market's apparent disregard, frequently, of current reports and happenings. Utility stock buying this week, for example, is attributed in the street to an anticipated increase in consumption of electricity, as industry becomes more active, and to the probability of further merger developments.

——ACCUMULATION OF THE UTILITY STOCKS HAS ARRESTED A SELLING movement again this week. United Corporation and other key issues have been in steady demand.

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September Output Moves Up

THE PRODUCTION OF ELECTRICITY by the electric light and power industry of the United States for the week ended Saturday, September 6, was 1,623,531,000 kw.-hr., it is estimated by the statistical research department of the National Electric Light Association. This is less than the output of the previous week, because of the Labor Day holiday, but the smaller decrease below the figure for the corresponding week in 1929 and the greater gain over 1928 both reflect improved conditions.

Comparative output figures for recent weeks follow:

Week Ended	Kilowatt-Hours	Per Cent Dec. 1930 from 1929	Per Cent Inc. 1930 Over 1928
Aug. 16	1,671,393,000	2.8	6.4
Aug. 23	1,675,757,000	2.8	6.0
Aug. 30	1,676,214,000	3.6	5.2
Sept. 6	1,623,531,000	2.5	8.7

The American Gas & Electric Company reports an output of 73,735,579 kw.-hr. by its subsidiaries for the week ended August 23, 1930, a decrease of 3 per cent below the corresponding period last year.

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July Drought Cuts Hydro Production

THE OUTPUT OF PUBLIC utility power plants in July as reported to the U. S. Geological Survey was 7,869,895,000 kw.-hr., about 2.5 per cent less than in July, 1929. This includes not only central stations for light and power but also electric railway and other plants contributing to the supply for public consumption.

The daily average was about 2 per cent below that for June, a normal seasonal decrease, but the output from water power fell off 9 per cent because of the prolonged drought in the regions east of the Rocky Mountains.

As the drought has continued through August, the Geological Survey report points out, the output of electricity by water-power plants will be still further curtailed. In July this output constituted 36 per cent of the total, against 38 per cent at the same time last year.

Fuel-consuming plants are stated to have ample capacity to meet the demand for power caused by shortage of water at water-power plants.

The effect of the scarcity of water in the several regions is evident from the following comparison of the average daily production with that of June and that of July, 1929. The regional production should not be confused with consumption; the two may differ appreciably because of transfers of energy.

Region	Compared with July, 1929 Total	Compared with July, 1929 Hydro	Hydro Compared with June
New England	— 6	+10	—22
Middle Atlantic	0	— 2	—16
East North Central	— 8	—24	—26
West North Central	+ 8	—10	—16
South Atlantic	—11	—28	—26
East South Central	+ 6	+ 1	— 2
West South Central	+ 7	*	*
Mountain	— 6	— 4	— 1
Pacific	+ 2	+ 2	+ 7
United States	— 3	— 6	— 9

*Hydro output small.

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Hasty Expansion of Public Utilities Uneconomic

IN AN address delivered before the Pennsylvania Electric Association meeting last week at Bedford Springs, Pa., W. A. Jones, president of the National Electric Light Association, declared that two major problems confronted the industry at the present time. The first is the downward trend of gross income in the light and power field per dollar invested and the second is the necessity of establishing a favorable public attitude toward the industry.

Mr. Jones declared that the first problem, the downward trend in gross income, was partly the result of the wholesale extension of service into thin territory. To combat this he suggested a service charge form of rate for the convenience of the user and, secondly, an intensive commercial sales effort to induce the widest use of utility products in co-operation with equipment and appliance manufacturers and electrical dealers. Mr. Jones said a recent survey showed that in 1922 $4.72 was invested for each dollar of annual gross revenue, but by 1929 the investment per dollar return had increased to $5.64, a gain of 19 per cent. During this same period average rates per kilowatt-hour for both power and light had decreased 8 per cent. Continuing, he said: "Due to the era of prosperity, we have not been fully alive to some of the fundamentals which make for successful operation. The trend, in part, is due to the wholesale extension of lines into thin territory, and in this period when our capital needs were being supplied with comparative ease we were often disposed to lose sight of the economic balance between cost and value of service. Light and power companies should always have a broad policy as to service and extensions, but this policy must meet the economic test."

A survey of domestic electric customers in the United States has revealed that there are approximately 8,000,000 non-profit customers out of a total of 20,000,000 and probably 6,000,000 are actually served at a loss. These users are a burden to the other customers and often stand in the way of rate reductions. "Designing of rational rate structures will play an important part in dealing with this class, but the only real insurance against the convenience user is the installation of a service charge form of rate. Such a method will protect the company, but the only satisfactory solution of the problem is by converting the non-profit customer into a profitable one."

Mr. Jones expressed approval of co-operation with appliance manufacturers to provide equipment suited to present-day needs and at prices which will per-

mit universal use. "Thanks to the intensive research and pioneering of manufacturing companies," he said, "there are now scores of electrical appliances for the convenience of our customers. Some of these devices use only a negligible amount of current, but others, such as the electrical range and refrigerator, are major-consuming devices. There was a time in our business when little was done to encourage wider use of our service through the sale of appliances, but the industry's attitude has changed. I predict that the next ten years will be ones of most intensive commercial development."

Taking up the second problem, public relations, Mr. Jones defended the industry's efforts to court public favor as nothing new, unfair or improper. He attributed the furors of the past few years to the communistically minded, to pettifogging politicians and to those who, seeing the rapid expansion of the industry, have assumed for it exorbitant profits.

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New Capital Issues

KANSAS CITY POWER & LIGHT COMPANY during the week ended September 11 made an offering of first mortgage 30-year 4¼ per cent gold bonds, series B, to the amount of $3,000,000, the price being 101 and interest, to yield 4.43 per cent. These bonds are secured by a direct first mortgage on all fixed property of the company. Proceeds of these bonds will be used to reimburse the company for the cost of permanent improvements, additions and betterments heretofore made, for the retirement of a purchase money mortgage of $624,720, and for other corporate purposes.

First mortgage 5 per cent gold bonds of the Kentucky Utilities Company were offered to the investing public at 99¾ and interest, yielding more than 5 per cent, a piece of financing involving a total of $2,500,000.

Electric Power & Light Corporation issued gold debentures to the amount of $15,000,000 at 92½ and accrued interest, to yield 5.40 per cent. These securities, dated February 1, 1930, mature February 1, 2030.

Central Maine Power Company made an offering of first and general mortgage gold bonds totaling $5,000,000, the price being 99½ and interest, yielding about 4.53 per cent.

Cumberland County Power & Light Company offered first mortgage gold bonds amounting to $2,400,000 at 95½ and interest, yielding over 4.80 per cent.

Sierra Pacific Power Company made an offering of first mortgage and refunding gold bonds, series A, at 95 and accrued interest, to yield 5.34 per cent, a piece of financing involving a total of $1,400,000.

Public Utility Investment Companies Unite

PUBLIC UTILITY HOLDING CORPORATION of America will acquire control of United States & Overseas Corporation through an exchange of stock, it is reported. Both concerns were organized last year by the Harris Forbes-American Founders group. The new plan gives to one of the largest utility and investment companies control of a similar organization interested largely in financing of public utilities abroad.

Completion of the purchase arrangements will give Public Utility Holding Corporation assets of over $100,000,000. Its total assets now exceed $81,000,000.

In connection with the exchange a new issue of $3 cumulative preferred stock will be created by the Public Utility Holding Corporation. For each ten shares of United States & Overseas common stock Public Utility Holding Corporation offers three shares of new $3 preferred stock, five shares of common stock with common stock purchase warrants and two detached common stock purchase warrants. The offer will expire on September 30. Annual dividends on the Public Utility Holding securities offered under the plan are equal to 90 cents a share annually for United States & Overseas common stock.

It is understood that the two corporations will continue to retain their respective identities.

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Employee Stock Ownership in National Electric Group

A NEW HIGH RECORD IN employee ownership of preferred stock has been reported for the principal subsidiaries of National Electric Power Company. As of July 31, fourteen companies, operating in fifteen Eastern states, reported that 5,522 employees out of a total of 6,832, or 80.8 per cent, had purchased or subscribed to preferred stock in their own companies.

The fact that four-fifths of the employees in this group have made stock purchases is especially striking, for at the end of April, 1929, only 28 per cent of the employees had invested in preferred stock. At that time only one company showed more than 50 per cent employee participation.

At the end of July, 1930, the average had increased to 80.8 per cent. One of the fourteen companies had obtained 100 per cent participation, three had more than 90 per cent, five more than 80 per cent and only two were below 50 per cent.

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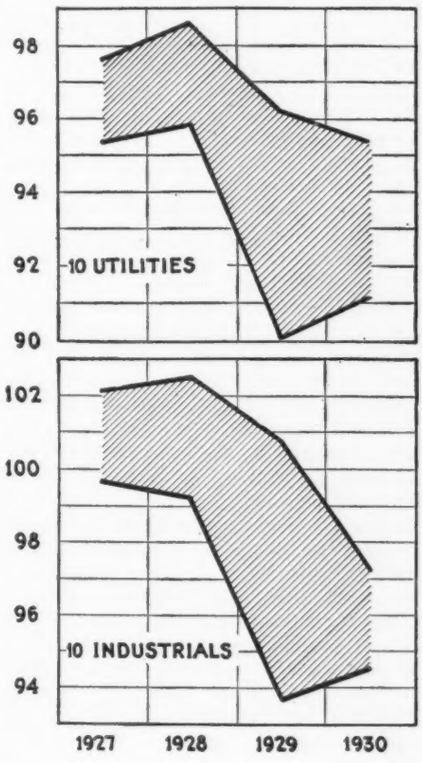
Bond Prices Approach 1929 Highs



Four-year bond trend of utilities and industrials

BASED on the creditable behavior of the bond market, and especially of certain issues sold since the beginning of the depression, the public utilities are shaping up a substantial bond financing program for the balance of the year. A few of the larger coming issues were referred to in last week's issue of the ELECTRICAL WORLD.

The Dow, Jones & Company average of ten public utility bonds touched a high of 95.42 for the year, against 96.27 for 1929 and a high of 98.60 for 1928. The average for the group is just now at this high point for the year, and according to indications will continue to establish new highs approaching the top prices of previous years. The attached graphs indicate the relative movements of representative utility and industrial bonds over the past four years, showing the higher position of the industrial group.

Several power and light company bonds sold during this year near or below par now show a gain of two or more points from the price of issue.

Business News and Markets

Allis-Chalmers Reports Lower Unfilled Orders

UNFILLED ORDERS OF THE Allis-Chalmers Manufacturing Company as of September 1 were $16,217,000, against $16,699,000 a month previous, a decline of $482,000. This drop, however, is only about one-third that of August from July. Up to and including July the company showed a gain each month and reached a high mark of unfilled orders July 1. Since then there have been two successive declines.

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Research Laboratories

THE RESEARCH INFORMATION SERVICE of the National Research Council is preparing a revision of its "Industrial Research Laboratories of the United States, Inciuding Consulting Research Laboratories," the third edition of which was published in 1927.

This bulletin is the only list of research laboratories known to the compilers and is undoubtedly used by many people, not only as a source of information concerning such laboratories but also as a mailing list for important announcements concerning new apparatus and processes, and for compilations of interest to research workers in industrial fields.

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Bailey Meter Opens Denver Office

THE BAILEY METER COMPANY of Cleveland, Ohio, manufacturer of power plant metering equipment, automatic combustion control and feed-water regulators, has opened a branch office in Denver, Colo. M. E. Reddick has been appointed manager of this branch.

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Swiss Steam Turbine for Anaconda Company

ESCHER WYSS & COMPANY of Zurich, Switzerland, have recently completed a contract with the Anaconda Copper Company of New York covering a steam turbine for normal and maximum outputs of respectively 20,000 kw. and 25,000 kw. for the Tocopilla plant. The machine has been designed as a single-casing turbine for coupling direct to a Siemens-Schuckert three-phase generator. The initial steam conditions are 14 atmospheres (200 lb. per square inch) at a temperature of 650 deg. F. New boilers will be erected later, and the steam pressure and temperature will then be raised to 400 lb. and 725 deg. F., respectively. The vacuum at full load amounts to about 95 per cent.

New Standards Approved by N.E.M.A. Committee

A NUMBER OF NEW STANDARDS on generators, motors and switchgear were approved by the standards committee of the National Electrical Manufacturers' Association at a meeting held in New York August 5. The new rules and revisions will be published later.

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Problems and Policies in Motor Distribution*

By C. E. PITTMAN

Member N.E.M.A. Joint Committee on Motor Merchandising

DEVELOPMENT of any manufacturing business may be analyzed and reduced to four fundamental elements, namely, research, design, production, distribution. Let us apply these four fundamentals to the electric motor business. From the day of its birth the electric motor has been continually improved and refined, so that today, after a half century of manufacturing, the motors produced are higher in efficiency, are better mechanically and electrically; have better insulation, are smaller in size, and, withal, lower in cost than ever before. Today you can buy 3 hp. of electric motor power at the same price as 1 hp. in 1900, or, stated another way, three 1-hp. motors now cost no more than one 1-hp. motor of 30 years ago.

Not only have we materially improved the product and reduced its cost, but we have materially improved our manufacturing processes and reduced the time required to build motors. Today, without additional buildings or machinery, we are able to produce more motors per square foot of floor space or per workman than ten years ago, and it has been conservatively estimated that our excess production capacity of motors is probably 50 per cent over normal demand. This seems to have been a result of the tremendous industrial activity brought about by the World War. This excess production capacity in itself is of particular importance in connection with the last of the four fundamentals mentioned above, namely, distribution, and makes our problems of distribution more difficult of solution.

As is indicated above, much has been done throughout all of American industry to increase the efficiency of our designing and of our manufacturing. Mass production, a development of this century, is now general in all lines. The next step must be mass distribution, and, strange as it may seem, I feel that the sales operations in practically all industries have lagged very materially behind the constructive, forward accomplishments of our engineering and manufacturing organizations.

The electric motor is made in thousands of sizes and types, varying in size over a range of one to a million, as, for example, a motor of one one-hundredth horsepower on the sewing machine in the home to a 10,000-hp. motor driving the main rolls in a steel mill. There seem to be endless numbers of kinds and types. Certainly no simple scheme of distribution will take care of such a wide range of size and variety.

Many methods of distribution

There are, of course, many methods of distribution, but these may be subdivided into two broad classes—first, direct selling by the manufacturer through his own salesmen, and, second, resale agencies, which again may be logically subdivided into two main divisions—first, the machinery manufacturers or their agents who sell the motor as a part of their motor-driven machines, and,

**From a paper delivered before the national convention, Association of Electragists.*

second, the resale agencies, of which the most important are the motor dealers.

To show that the three elements, the product, the market and the method of distribution, must be considered simultaneously, take these three cases—first, a 10,000-hp. motor driving the main rolls in a steel mill; second, a 5-hp. motor driving a line shaft in a small machine shop; third, a 1/50-hp. motor driving a vacuum cleaner. In each case not only the product but its market and the buying habits of the user all have their influence on the method of distribution from manufacturer to consumer. In each case economics dictate the avenue of distribution, just as ultimately economics develop the answers to all such business problems.

The company with which I am connected believes that there is an economic place for the motor dealer in the field of motor distribution, and I feel that many other manufacturers have a similar view. Personally, I feel that in the past, at least, the legitimate field for the operation of the motor dealer has not been recognized by the dealer himself. Once he has found his field, he must then become a strong, aggressive selling force and not simply an order taker.

Dealer needs maker's aid

I feel that the manufacturer has not been able to set up a selling policy which will adequately protect the motor dealer in the field which he should economically serve. Furthermore, after securing his franchise, the motor dealer has too often been left without further assistance from the manufacturer, with the result that he is not kept posted on the design, construction, and application of motors he has tried to sell, and he has lost interest in the welfare of the company he represents. The manufacturer should be able continually to assist the dealer in improving his sales methods, in the analysis of his local market, and in improved methods of service to his customers.

There are four elements that determine the goods you buy and they are price, design, delivery, and service. Price and delivery are problems requiring solution between each dealer and his manufacturer and they need no further comment here. The question of design includes all such problems as the construction of the product, its adaptability for the specific job, and the ability of the product, year in and year out, to give faithful service to the user. I feel that manufacturers and dealers alike are lax in informing themselves of the merits of their product.

The most important of all these questions, so far as it affects the motor dealer and his future, is that of service. Unless he can hold an economic place in the field of motor distribution because of the excellency of his service, the law of economics will force him out. Fortunately, however, this fundamental principle is recognized by the motor specialists of your organization, for it is written in your definition of a motor specialist that he must be "regularly in the business of selling motors, repairing and installing the same, and properly equipped and qualified to service and install motor apparatus and accessories connected therewith." This obviously means motors, control equipment, and renewal parts for both.

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Brooklyn Edison Buys Network Protectors

BROOKLYN EDISON COMPANY has recently ordered 30 2,000-amp. subway type network units from the Westinghouse Electric & Manufacturing Company at a total value of approximately $52,000. These protectors are to be used in the general expansion program of the Brooklyn Edison Company in adding to its present low-voltage a.-c. network system. The protectors will be mounted in submersible tanks that bolt directly to the side of network transformers, which in turn serve as the mounting for the network protectors.

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Vacuum Cleaner Sales

VACUUM CLEANER SALES for the first six months of 1930 are shown in the following table:

January	73,721	April	103,339
February	89,414	May	92,280
March	114,460	June	60,084

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Sales of Copper Unusually Heavy

BETWEEN TEN AND ELEVEN THOUSAND TONS of copper was sold in the domestic market in the week ended September 10, which represented the best week's business since early August. The sales, however, were not sufficient to absorb all the offerings at 10¾ cents, and, despite press reports to the contrary, there was no evidence of any 10¾-cent seller revising his quotations upward to 11 cents, the level at which the large producers continue to hold.

	Sept. 3, 1930 Cents per Pound	Sept. 10, 1930 Cents per Pound
Copper, electrolytic	10¾–11	10¾
Lead, Am. S. & R. price	5¼	5¼
Antimony	7¼	8
Nickel, ingot	35	35
Zinc, spots	4.65	4.60–4.65
Tin, straits	29⅜	29.90
Aluminum, 99 per cent.	23.30	23.30

British Equipment Orders for Grid Scheme

CONTRACT FOR THE SITE, WORKS and foundations for the great new power station at Dunston-on-Tyne, England, which is being built in connection with the northeast electricity scheme of the national "grid," has just been placed with Sir Robert McAlpine & Sons, Newcastle. The contract is valued at $1,000,000 and is expected to provide employment for 400 men. Valuable contracts for buildings, switchgear, and more than 1,400 steel towers, to be erected to carry the overhead grid lines, are expected to be placed shortly.

A contract for three 50,000-kw. turboalternators, at a cost of $2,000,000, has also been placed in connection with the northeastern scheme, both these contracts having been placed by the Newcastle Electric Supply Company.

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TRADE NOTES

Jewell Electrical Instrument Company, Chicago, Ill., announces the appointment of B. F. Keith Company of Atlanta, Ga., to represent it in Florida, Georgia, South Carolina and northern Alabama.

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E. J. A. Gardiner and M. T. Gardiner, comprising the firm of Gardiner Brothers, with salesrooms in Los Angeles and San Francisco, Calif., have secured the sales agency in California for the Marion line of electrical appliances manufactured by Rutenber Electric Company, Marion, Ind.

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Foster Wheeler Corporation, New York, opened a new branch office at 712 Thompson Building, Tulsa, Okla., in charge of C. C. Steward.

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Bakelite Corporation of 247 Park Avenue, New York, has moved to the eighteenth floor, same address.

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Bendix-Westinghouse Automatic Air Brake Company, Pittsburgh, has completed arrangements with Commercial Investment Trust, Inc., for the financing of time-payment sales.

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General Electric Company paid $56,974 to employees during the first half of 1930 for suggestions of plans to improve their jobs.

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Samson-United Corporation, Rochester, N. Y., manufacturer of electrical appliances, announces the opening of a New York office at 200 Fifth Avenue. A. A. Berman has been appointed manager.

Market Conditions

EQUIPMENT orders in the Eastern district have slowed down further. Central-station business is held to immediate requirements. Small motor sales feature New England trade and manufacturers in the Southeast look for definite improvement this month. ——GROSS VOLUME IS AT A LOW POINT on the Pacific Coast, but inquiries are reassuring.

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PACIFIC COAST

—THOUGH IMPROVEMENT IN GROSS VOLUME *is very slow, there is much interest and many inquiries which are apparently due to a general increase in the momentum of business. These past months have also given a chance for educational work in such new lines as thin wall conduit and ABC flexible metallic conduit.*

State business is fair, with many shipments ranging around $500 each. Lighting, as usual, provides the contractors' bulk, including such special jobs as 50 units for a Bay Beach resort, a similar equipment for the football practice field of Stanford stadium, 150 floodlights for a department store in Los Angeles, and 350 floodlights for the Southern California Edison Building there. Street-lighting increase includes a 21-light and a 77-duplex job for Oakland, a 37-light job for Gustine, a 56-duplex $22,000 job for Porterville. The outstanding street-lighting job covers a 19-mile boulevard job for San Francisco, estimated as requiring 856 standards. This will need careful working out, but will eventuate. The power apparatus field is rather quiet, with the only outstanding orders reported covering a $6,000 switchboard for the Mare Island Navy Yard, a carload of Westinghouse high-tension insulators for San Francisco, and $25,000 worth of Westinghouse instruments for a chemical company in Los Angeles. The demand for distributing transformers, meters and small motors is still subnormal. Government purchasing continues good with a $75,000 job for heating and lighting the hangars and barracks for Marsh Field at Riverside and motor-generator sets and 30-hp. motors required for the various navy yards along the coast.

Several interesting power line installations are reported, such as a 50-mile $100,000 line in the San Luis Obispo country to cover pumping and refrigerating requirements, a 25-mile irrigation line to serve the Salt River district at Phoenix, Ariz., a $15,000 cable order for rubber and leaded sector cables, ranging from size No. 2 to 1,500,000 circ.mil., for San Francisco, an addition to the Pasadena municipal plant, and a $20,000 underground wiring job for the Idora Park district of Oakland.

Announcement of the resumption of lumbering operations in the Grays Harbor district by several large mills, some on a one-shift six-day-per-week basis, others on a two-shift four-day-per-week basis, give indications of renewed buying from these sources. Although sales to mills were light last week, reports of inquiries for motors for replacements and minor additions are said to be encouraging. Central-station buying remains at a minimum, but considerable seasonal lamp business is developing, and appliance sales, particularly ranges, are reported holding up well.

CONSTRUCTION PROJECTS

Los Angeles, Calif., will receive bids until September 23 for electric meters. Pasadena, Calif., will soon take bids for an addition to municipal electric light and power plant to cost $150,000. Philadelphia Quartz Company of California, Inc., Berkeley, has filed plans for a plant to cost $100,000. Edison Electric Appliance Company, Ontario, Calif., has plans for an addition to cost about $175,000. Los Angeles and San Bernardino, Calif., plans ornamental lighting systems. Northwest Public Service Company, Portland, Ore., has plans for a power substation. Bend and LaGrande, Ore., plan ornamental lighting systems. Seattle, Wash., plans a power substation. Dairymens' Co-operative Creamery of Boise Valley, Inc., Caldwell, Idaho, will build a milk and creamery plant to cost over $200,000. Bureau of Reclamation, Denver, Colo., will receive bids until September 23 for one 5,000-kva. a.c. generator, three or four transformers, two gang-operated disconnecting switches, switchboard and auxiliary apparatus for Shoshone power project.

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SOUTHWEST

—ACTIVITY AMONG INDUSTRIAL CONCERNS *noted last week has been maintained and apparently is a little better. The feature which is at the moment attracting the most interest is floodlighting for baseball and football fields.*

One manufacturer has closed contracts for the electrical equipment for three football fields, the average cost of each installation to be about $10,000. One local baseball field is being used regularly at night by negro clubs. Other contracts closed include a bank of transformers for a power company in Arkansas costing $39,000. Equipment for a whiteway lighting job $8,000, and motors for driving four flour mills to cost $7,500.

CONSTRUCTION PROJECTS

Great Lakes Pipe Line Company, Tulsa, Okla., plans oil terminal at Kansas City, Mo., to cost over $350,000. Holton, Kan., has plans under way for an addition to municipal electric light and power plant to cost about $80,000. Oklahoma Gas & Electric Company, Oklahoma City, Okla., will proceed with superstructure for a power plant to cost $250,000. Southern Air Transport, Inc., Dallas, Tex., plans hangar with shop facilities to cost $100,000. Panhandle Power & Light Company, Borger, Tex., will proceed with superstructure for steam-operated electric power plant at Mobeetle, Tex., to cost $300,000.

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MIDDLE WEST

—VERY LITTLE CHANGE *in general business is noticeable this week in the Middle West section. While evidence of a slowly increasing volume of business is somewhat more apparent, general conditions are still somewhat spotty. The underlying tone is more cheerful, however, and better business is looked for this month.*

—MAJOR ACTIVITIES CONTINUE *much in the same position, while some much-needed building construction is being scheduled.*

Various utility companies are proceeding with their investment programs, while operating costs are being conservatively scheduled. Some of the interesting items placed this week include a 22-kv. switchgear complete with appurtenances and spare parts to cost approximately $1,250,000, fire protection system to cost $40,000, three 333-kva., 12,000-volt, single-phase, oil-insulated, self-cooled transformers, nine 150-kva., 2,200-volt, single-phase pole type distribution transformers and several construction orders aggregating $100,000.

CONSTRUCTION PROJECTS

Newport Company, Carrollville, Wis., plans addition to chemical plant to cost over $100,000. Madison, Wis., is contemplating plans for an ornamental lighting system. Detroit, Mich., will receive bids until September 23 for motor-driven centrifugal pumping equipment for capacity of 17 million gals. daily. Pure Oil Company, Chicago, Ill., plans oil refining plant at Toledo, Ohio, in conjunction with Hickok Oil Company, Toledo, to cost $5,000,000. Marietta, Ohio, plans municipal electric light and power plant to cost over $100,000. Contracting Officer, Material Division, Air Corps, Wright Field, Dayton, Ohio, will receive bids until September 22 for two motor-generator sets (Circular 108), and until September 17 for one storage battery charging equipment (Cir-

cular 105). Richmond, Ind., has authorized a fund of $1,000,000 for addition to municipal electric light and power plant, including installation of 15,000-kw. generator. Earl Bronson, Quinn, S. D., has franchise for light and power service and plans electric power plant and system.

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EASTERN

—INQUIRIES CONTINUE ACTIVE *for electrical equipment in the Eastern district, both from central stations and industrials, but actual orders are more hesitant than for several weeks past. Maturing commitments, moreover, are of limited amounts and volume business seems to represent the one encouraging factor at the present time.*

—POWER STATION DEMAND *is rather rigidly scheduled for immediate requirements, covering substation apparatus and line construction. Railway electrification work is expected to be quiet for several weeks, following recent heavy buying. Industrial activity is centered in iron and steel account, petroleum refineries and chemical plant expansion; other lines are dull.*

A large order is pending for marine equipment, with contracts to be placed during the next fortnight, covering complete machinery for four new turbo-electric passenger and cargo vessels for the Panama Mail Steamship Company, New York, for New York-Central America-California service; each liner will have a rated speed of 19 knots per hour in intercoastal run, with reserve power when occasion requires, and is estimated to cost close to $4,000,000, making a gross commitment approximating $16,000,000. Complete electrification will be provided for all features of operation and service. A metropolitan central station has placed an order with a New York manufacturer for transformers and accessory equipment to cost $35,000. The Waldorf-Astoria Hotel has awarded a contract to a local maker for switchboard equipment to cost $50,000. A Pennsylvania manufacturer has secured an order for a turbo-generator unit for a municipal installation in Missouri. A New York company has taken a contract for a switchboard and equipment for a municipal station in South Dakota.

Business for prime movers and heavy equipment looks promising during the next 60 to 90 days for new power projects definitely scheduled by a number of utility companies. The Central Arizona Light & Power Company, Phoenix, in co-operation with the United Copper Company, Globe, Ariz., is developing plans for a hydro-electric power project on the Salt River to cost over $2,000,000; the California-Oregon Power Company, Medford, Ore., will build a similar station on the Klamath River, reported to cost in excess of $3,000,000. The Memphis Power & Light Company, Memphis, Tenn., will build a steam-operated electric power station to cost $1,000,000; the White River Power Company, Little Rock, Ark., proposes to expend $47,340,000 on a hydro-electric power project on the Buffalo River.

CONSTRUCTION PROJECTS

Signal Supply Officer, Signal Corps, United States Army, Brooklyn, will receive bids until September 23 for 101,500 ft. conduit (Circular 20); at same time for 40,000 terminals, 650 condensers and 350 resistors (Circular 25), and at same time for 300 transformers (Circular 22). National Union Radio Corporation, New York, contemplates radio tube manufacturing plant in vicinity of Los Angeles, Calif., to cost over $300,000. International Milling Company, Buffalo, N. Y., has filed plans for a grain elevator to cost about $400,000. A. P. W. Paper Company, Albany, N. Y., contemplates an addition to double capacity, reported to cost over $300,000. City Commission, Trenton, N. J., will receive bids until September 19 for one 220-kw. rotary converter, with switchboards and transformers, also for one a.c. current switchboard. Perth Amboy, N. J., has plans maturing for an ornamental lighting system. Gulf Refining Company, Pittsburgh, Pa., will proceed with oil refining plant on Neville Island to cost over $4,000,000. Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until September 16 for two turbo-generator sets and spare parts for Mare Island Navy Yard (Schedule 4061), and at same time for three motor-generator sets (Schedule 4062.)

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SOUTHEAST

—ALTHOUGH VOLUME IN ALL LINES *continued small during the past week, jobbers and manufacturers report considerable improvement just ahead.*

A Georgia railway company purchased a 1,000-hp. motor and control equipment, a ten-panel switchboard and a 750-kva. substation with necessary installation material, totaling approximately $65,000. A manufacturer of copper reported a sale of a carload of bare and weatherproof wire to a Georgia utility company. A Georgia construction company purchased three 300-kva. transformers costing $7,500 and one 300-kva. subway transformer at $2,000. A Georgia utility company purchased meters to the amount of $2,500, transformers to the amount of $8,000, and arresters to the amount of $300. A contract for lighting equipment amounting to approximately $10,000 was let during the week by an Alabama cotton mill.

CONSTRUCTION PROJECTS

Norfolk, Va., contemplates electrification of waterworks pumping plant at Suffolk, Va. Emerald Coal Company, Rockport, Ky., plans power plant and tipple to cost over $100,000. Southern Coal & Coke Company, Knoxville, Tenn., plans tipple and other equipment at mining properties at Coal Creek, Tenn., to cost over $150,000. Raylaine, Inc., Asheville, N. C., recently organized, plans synthetic fiber mill at Biltmore, N. C., to cost over $400,000. Mississippi Power & Light Company, Jackson, Miss., plans extensions in system at Greenwood, Miss. Standard Oil Company of Louisiana, Inc., New Orleans, La., plans oil storage and distributing plant at Mobile, Ala., to cost $500,000. Toccoa Electric Power Company, Blue Ridge, Ga., has plans for a power plant to cost $100,000. Georgia Power Company, Atlanta, plans extension in transmission line from Kingsland to Woodbine.

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NEW ENGLAND

—INQUIRIES FOR HEAVY ELECTRICAL MACHINERY, *turbo-generators and motors are gaining, according to manufacturers. Orders are quiet for general scheduled materials, but small motor sales are increasing and the volume of sales reported by manufacturers for the past week compares favorably with that of last year. Machine tool manufacturers report increasing inquiries for fractional-horsepower motors.*

Central station supplies are spotty. Recently steel for two substations was ordered and several small lots of insulators. Electric furnace interest is active. Inquiries are coming in at a good rate and an interesting order for electric heating furnaces for lead melting was recently placed with a prominent manufacturer. Industrial equipment in many lines seems to be in a better position for orders than for the past few weeks, according to a prominent representative, due to the desire on the part of manufacturing interests to improve power operations in the near future.

Some specialties in the electrical market continue to hold up well in favor. Recently street-lighting units for a prominent Boston thoroughfare were ordered; electrical timepieces are in strong demand. Orders for 70 of these units were recently reported; electric refrigerator sales maintain a steady level and interior electric illumination units are showing an encouraging trend. Sales of electric sound signals have been strong and a number of installations of interest are noted.

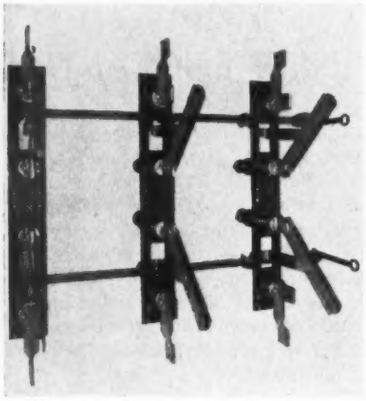
CONSTRUCTION PROJECTS

Berst, Foster, Dixfield Company, Dixfield, Me., plans addition to wood novelty plant, reported to cost close to $90,000. DuPont Viscoloid Company, Leominster, Mass., plans addition to composition plant to cost over $100,000. Simonds Saw & Steel Company, Fitchburg, Mass., has plans maturing for new plant to cost over $500,000. S. G. Redshaw Company, Ansonia, Conn., contemplates a paper-box manufacturing plant to cost about $50,000.

New Equipment Available

Disconnect Switches for Pipe Frame Mounting

FOR PIPE FRAME MOUNTING in a minimum space, a new type of front and back connected, 15-kv., double, three-pole, stick-operated, gang-disconnecting switch has been developed



by the Champion Switch Company, Kenova, W. Va.

The individual phase rods of this switch are designed to pass over the center line in both open and closed positions, thus securing a positive lock. Conical-shaped bushings on the bronze-operating shaft bearings permit misalignment of individual phases without binding the operating shaft. The insulators are of the solid one-piece high strength type.

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SERVICE BRACKETS FOR USE with multiple-conductor cables under one braid are announced by the Line Material Company, South Milwaukee, Wis. This bracket, designated "Wedg-Tite," consists of a metal clamping wedge which acts on bakelite jaws, a hook and a bale. The cable is fed through the bakelite jaws and the tension automatically causes these jaws to close. Cable from $\frac{1}{4}$ in. to $1\frac{1}{8}$ in. in diameter may be used.

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Outdoor, Accessible Fuse Meter Service Switches

OUTDOOR AND WEATHERPROOF TYPES of accessible fuse meter service switches are announced by the Wadsworth Electric Manufacturing Company, Inc., Covington, Ky.

The outdoor type has conduit knockouts in bottom and sides, while the weatherproof type has them in the bottom only. The two types are identically the same in other respects. The 30- and 60-amp. switch cabinets are constructed of 16-gage and the 100-amp. cabinets are of 14-gage cold-rolled steel. Coats of aluminum and black enamel protect the cabinets from the elements.

Meters are read through a double strength clear glass window set between cork gaskets. The cabinets are sealed by a slotted brass rod which may be replaced by a padlock. A bossed cover with brass spring hinges covers the fuse mechanism. Meter adjustments can easily be made when main cover is removed, the walls of the back section being recessed opposite the meter case.

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Machine Lays Cable in Single Operation

ARMORED CABLE MAY BE LAID to depths as great as 30 in. without digging trenches by means of a hydraulic cable-laying machine developed by the American Tractor Equipment Company, Oakland, Calif.

This machine, designated as the "Ateco" cable layer, has two cutting teeth, located one behind the other. At the deepest setting the front tooth cuts to a depth of 18 in., while the rear tooth, which is 4 in. wide, goes to a depth of 30 in. A dirt shield, which incases guide rollers for the cable and a cable wheel, is attached to the rear of the frame. A hitch is provided for attaching a trailer to carry a reel and cable.

The cable layer meets the demands of power, telephone and telegraph companies for an efficient method of laying cable and is also suitable for laying underground wires on airports, according to the manufacturer. It lays the cable as fast as the tractor drawing it moves forward.

Dust-Tight Inclosures for Starting Devices

IMPROVED DUST-TIGHT INCLOSURES for across-the-line and combination starters are announced by the Industrial Controller Division of the Square D Company, Milwaukee, Wis. The inclosures are for use in such places as foundries, cement mills, flour mills, etc., where special protection may be had against excessive dust.

Heavy gage steel cabinets with heavy strap iron mounting brackets are incorporated in the design. Cast-iron conduit flanges with live rubber gaskets are furnished on the top and bottom of the cabinet to insure dust-tight conduit connections.

▼

BUS SUPPORTS FOR 37-KV. INSTALLATIONS where high capacity current buses are to be used and high mechanical strength is required are announced by the Champion Switch Company, Kenova, W. Va. These supports are constructed with two solid piece insulator units clamped by heavy flanged bolts. The conductor clamps are equipped with spacers of high-strength non-magnetic bronze.

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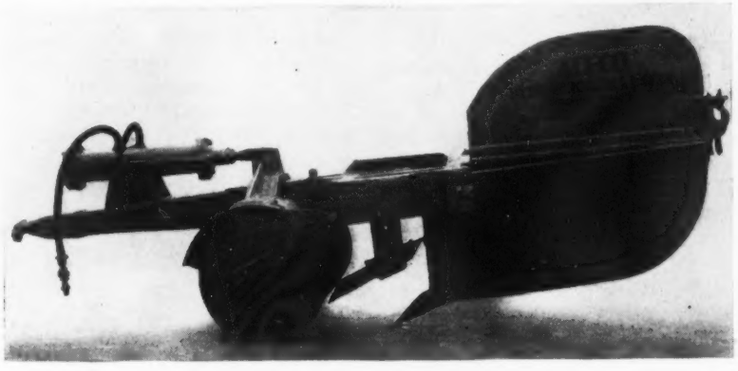
Double Brush Prevents Commutator Sparking

TO AVOID SPARKING BETWEEN the brushes and the commutator of high-ampere rotating electrical machines, a double brush holder of die-cast construction has been developed by the Westinghouse Electric & Manufacturing Company.

The two individual brushes in this



double brush holder are never bounced off the commutator at the same instant, and commutator sparking does not occur, according to the manufacturer.

The pressure on each brush segment can be regulated independently by means of adjustable tension springs.